START

0029913
1 of 4

Mr. John Grantham
State of Washington
Department of Ecology
Nuclear & Mixed Waste Program
P. O. Box 47600
Olympia, WA 98504-7600

FLUOR DANIEL, INC.

Date:DECEMBER 21, 1992

Reference: Hanford Waste Vitrification Plant
DOE Contract DE-AC06-86RL10838
Fluor Contract 8457

Transmittal No.: WDOE-285

Dear Mr. Grantham:

TRANSMITTAL

We enclose * copy of the items listed below. These are issued per US-DOE request.
*2 FULLSIZE BLUELINES ROLLED & 2 SPECIFICATIONS, & 1 REDUCED

Response due to Fluor: N/A
Responds to: MILESTONE P06A.02

NUMBER	Rev.	Date	TITLE
SEE TRANSMITTAL ATTACHMENT	----	--------	P06A MELTER VESSEL ASSEMBLY

Distribution:
REFERENCE:FRP-677,FUP-314
R. L. Long: DOE-RL w/0
TWP/AME Corresp Cntrl Cntr, MSIN A5-10
(P06A PACKAGE),w/0
P. Felise, WHC-RL (MSIN G6-16), w/1F, 1 SPEC
Environmental Data Management Center
(MSIN H6-08), w/1F, 1 SPEC
D. Duncan, US EPA, Region X w/0

Very truly yours,

Rosalie Cadenas for
R. S. Poulter
Project Director

RSP:JMJ:lh

STATUS DATE 12/19/92
CONTRACT 845734

CORDS

DISCIPLINE	PACKAGE	SPECIFICATION NUMBER	PKG REV	PACKAGE TITLE	SECTION NUMBER	SECTION REV	SECTION TITLE	FDR XMTL	FDR DATE	AFC XMTL	AFC DATE
	P06A	B-595-P-P06A		MELTER VESSEL					/ /		/ /
40	P06A				01730	0	OPERATION AND MAINTENANCE DATA	FRP-580	09/28/92	FRP-	12/18/92
40	P06A				05010	0	MODIFIED INCONEL ALLOY 690 MATERIAL	FRP-580	09/28/92	FRP-	12/18/92
40	P06A				05011	0	MODIFIED INCONEL ALLOY 690 WELD WIRE	FRP-580	09/28/92	FRP-	12/18/92
40	P06A				05060	0	WELDING - STRUCTURAL	FRP-580	09/28/92	FRP-	12/18/92
40	P06A				05063	0	WELDING - PRESSURE VESSELS	FRP-580	09/28/92	FRP-	12/18/92
40	P06A				13250	0	FABRICATION OF MELTER AND FRAME ASSEMBLY	FRP-580	09/28/92	FRP-	12/18/92
40	P06A				13251	0	FABRICATION AND INSTALLATION OF MELTER REFRACTORY AND INSULATION	FRP-580	09/28/92	FRP-	12/18/92
40	P06A				13252	0	PRECAUTIONS FOR FABRICATION, HANDLING & STORAGE OF STAINLESS STEEL & NICKEL ALLOYS	FRP-580	09/28/92	FRP-	12/18/92
40	P06A				13253	0	FABRICATION OF MELTER BUS BARS	FRP-580	09/28/92	FRP-	12/18/92
40	P06A				13254	0	FABRICATION & INSTALLATION OF MONOFRAX K3 REFRACTORY	FRP-580	09/28/92	FRP-	12/18/92
40	P06A				14400	0	MELTER FRAME LIFTING YOKE FABRICATION	FRP-580	09/28/92	FRP-	12/18/92
40	P06A				16120	0	SOLDERING - ELECTRICAL	FRP-580	09/28/92	FRP-	12/18/92
60	P06A				16610	0	ELECTRICAL REQUIREMENTS FOR PACKAGED EQUIPMENT	FRP-580	09/28/92	FRP-	12/18/92
70	P06A				17915	0	THERMOCOUPLE FURNISHED WITH MELTER EQUIPMENT	FRP-580	09/28/92	FRP-	12/18/92

TOTAL: 15

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION, 57/PIPING STRESS, 58/PIPING MATERIAL, 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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CORDS

DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	DWG REV	SIGNATURE DATE	DRAWING TITLE	FDR DATE	FDR XMTL	AFC DATE	AFC XMTL
30	P06A	M-2-116009	1	0	12/18/92	MELTER VESSEL ASSEMBLY TITLE SHEET	09/28/92	FRP-580	12/18/92	FRP-677
30	P06A	M-2-116010	1	0	12/18/92	MELTER VESSEL ASSEMBLY DWG INDEX	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120052	1	0	12/18/92	ME-130-001 MELTER VESSEL/FRAME ASSY, PARTS LIST & NOTES	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120052	2	0	12/18/92	ME-130-001 MELTER VESSEL/FRAME ASSY MELTER & FRAME ASSY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120052	3	0	12/18/92	ME-130-001 MELTER VESSEL/FRAME ASSY MELTER ASSY/CONN LOC	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120052	4	0	12/18/92	ME-130-001 MELTER VESSEL/FRAME ASSY SECTIONS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120052	5	0	12/18/92	ME-130-001 MELTER VESSEL/FRAME ASSY TABLES & NOTES	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120075	1	0	12/18/92	ME-130-001 MELTER SHELL INCONEL DAM WELDMENT	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120076	1	0	12/18/92	ME-130-001 MELTER VESSEL/FRAME ASSY MISC PIPING DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120086	1	0	12/18/92	ME-130-001 POUR SPOUT HEATER SPRT ASSEMBLY & PARTS LIST	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120086	2	0	12/18/92	ME-130-001 POUR SPOUT HEATER SPRT CARRIAGE ALIGN BRACKET	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120086	3	0	12/18/92	ME-130-001 POUR SPOUT HEATER SPRT ACTIVE RAIL BRACKET	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120086	4	0	12/18/92	ME-130-001 POUR SPOUT HEATER SPRT PASSIVE RAIL BRACKET	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120086	5	0	12/18/92	ME-130-001 POUR SPOUT HEATER SPRT PASSIVE RAIL KEY GUIDE	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120086	6	0	12/18/92	ME-130-001 POUR SPOUT HEATER SPRT ACTIVE RAIL KEY GUIDE	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120086	7	0	12/18/92	ME-130-001 POUR SPOUT HEATER SPRT DETAILS & SECTION	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120086	8	0	12/18/92	ME-130-001 POUR SPOUT HEATER SPRT PASSIVE RAIL ASSEMBLY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120086	9	0	12/18/92	ME-130-001 POUR SPOUT HEATER SPRT ACTIVE RAIL	09/28/92	FRP-580	12/18/92	FRP-677

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION, 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	DWG REV	SIGNATURE DATE	DRAWING TITLE	FDR DATE	FDR XMTL	AFC DATE	AFC XMTL
						ASSEMBLY				
40	P06A	H-2-120086	10	0	12/18/92	ME-130-001 POUR SPOUT HEATER SPRT MODIFIED GEAR BOX	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120122	1	0	12/18/92	ME-130-001 POUR SPOUT DUMMY HEATER ASSEMBLY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120122	2	0	12/18/92	ME-130-001 POUR SPOUT DUMMY HEATER SUB-ASSY & DETAIL	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120123	1	0	12/18/92	ME-130-001 DUMMY INCONEL TUBE ASSEMBLY & PARTS LIST	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120123	2	0	12/18/92	ME-130-001 DUMMY INCONEL TUBE DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120124	1	0	12/18/92	ME-130-001 MELTER SHELL DUMMY DRAIN PLUG ASSY & PARTS LIST	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120153	1	0	12/18/92	MY-130-004 MELTER FRAME PARTS LIST & NOTES	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120153	2	0	12/18/92	MY-130-004 MELTER FRAME NOZZLE INSTALLATION	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120153	3	0	12/18/92	MY-130-004 MELTER FRAME ASSEMBLY & DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120153	4	0	12/18/92	MY-130-004 MELTER FRAME HOLE LOCATION DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120153	5	0	12/18/92	MY-130-004 MELTER FRAME SECTIONS & DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120153	6	0	12/18/92	MY-130-004 MELTER FRAME SECTION & VIEWS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120153	7	0	12/18/92	MY-130-004 MELTER FRAME SECTIONS & DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120153	8	0	12/18/92	MY-130-004 MELTER FRAME SECTIONS & DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120153	9	0	12/18/92	MY-130-004 MELTER FRAME NOZZLE DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120194	1	0	12/18/92	ME-130-001 MELTER SHELL POUR SPOUT ADAPTER ASSY & PARTS LIST	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120194	2	0	12/18/92	ME-130-001 MELTER SHELL POUR SPOUT ADAPTER WELDMENT & DETAIL	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120194	3	0	04/21/92	ME-130-001 MELTER SHELL POUR SPOUT ADAPTER DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120235	1	0	06/27/92	ME-130-001 MELTER TOP HEAD PARTS LIST AND NOTES	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120235	2	0	06/26/92	ME-130-001 MELTER TOP HEAD ASSEMBLY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120235	3	0	06/27/92	ME-130-001 MELTER TOP HEAD COOLING JACKET	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120235	4	0	07/01/92	ME-130-001 MELTER TOP HEAD LIFTING LUGS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120235	5	0	07/01/92	ME-130-001 MELTER TOP HEAD NOZZLES-E,G1,G6,G10	09/28/92	FRP-580	12/18/92	FRP-677

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION, 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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40	P06A	M-2-120235	6	0	07/01/92	ME-130-001 MELTER TOP HEAD NOZZLES F1,F6,G18	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120235	7	0	07/03/92	ME-130-001 MELTER TOP HEAD NOZZLES-PLAN VIEW	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120235	8	0	07/01/92	ME-130-001 MELTER TOP HEAD NOZZLES-SECTIONS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120235	9	0	03/11/92	ME-130-001 MELTER TOP HEAD NOZZLE-A-DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120235	10	0	03/11/92	ME-130-001 MELTER TOP HEAD NOZZLE-T-DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120235	11	0	07/08/92	ME-130-001 MELTER TOP HEAD FEED TUBE SUPPORTS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120235	12	0	08/12/92	ME-130-001 MELTER TOP HEAD FEEDTUBE SUPPORT DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	1	0	09/03/91	ME-130-001 MELTER SHELL PARTS LIST & NOTES	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	2	0	09/03/91	ME-130-001 MELTER SHELL PLAN VIEW	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	3	0	09/03/91	ME-130-001 MELTER SHELL SECTIONS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	4	0	09/03/91	ME-130-001 MELTER SHELL BOTTOM VIEW	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	5	0	08/29/91	ME-130-001 MELTER SHELL ELECTRODE NOZZLE SECTION	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	6	0	08/13/91	ME-130-001 MELTER SHELL DOME HTR NOZZLE DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	7	0	08/16/91	ME-130-001 MELTER SHELL DOME HTR NOZZLE DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	8	0	08/16/91	ME-130-001 MELTER SHELL COOLING JACKET LAYOUT	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	9	0	08/19/91	ME-130-001 MELTER SHELL COOLING JACKET SECTIONS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	10	0	08/19/91	ME-130-001 MELTER SHELL COOLING JACKET	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	11	0	08/13/91	ME-130-001 MELTER SHELL JACKET MANIFOLD OUTLETS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	12	0	08/29/91	ME-130-001 MELTER SHELL RISER SECTION	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	13	0	08/30/91	ME-130-001 MELTER SHELL POUR SPOUT JACKET	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	14	0	08/30/91	ME-130-001 MELTER SHELL RISER END	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	15	0	08/20/92	ME-130-001 MELTER SHELL RISER END SECTIONS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	16	0	08/20/91	ME-130-001 MELTER SHELL RISER PAD DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	17	0	08/21/92	ME-130-001 MELTER SHELL RISER JACKET	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	18	0	09/04/91	ME-130-001 MELTER SHELL RISER DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	19	0	09/09/91	ME-130-001 MELTER SHELL RISER JACKET PIPING	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	20	0	08/22/91	ME-130-001 MELTER SHELL RISER MANIFOLD	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	21	0	08/24/91	ME-130-001 MELTER SHELL BOTTOM JACKET MANIFOLD	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120236	22	0	09/10/91	ME-130-001 MELTER SHELL NOZZLE N SECTIONS	09/28/92	FRP-580	12/18/92	FRP-677

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION, 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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CORDS

DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	DWG REV	SIGNATURE DATE	DRAWING TITLE	FDR DATE	FDR XMTL	AFC DATE	AFC XMTL
40	P06A	M-2-120236	23	0	09/10/91	ME-130-001 MELTER SHELL DRAIN VALVE SUPPORTS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120237	1	0	03/17/92	MECHANICAL MELTER VESSEL ASSEMBLY DIMENSIONAL RECORD	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120237	2	0	05/07/92	MECHANICAL MELTER VESSEL ASSEMBLY DIMENSIONAL RECORD	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120237	3	0	05/07/92	MECHANICAL MELTER VESSEL ASSEMBLY DIMENSIONAL RECORD	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120237	4	0	03/17/92	MECHANICAL MELTER VESSEL ASSEMBLY DIMENSIONAL RECORD	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120237	5	0	05/08/92	MECHANICAL MELTER VESSEL ASSEMBLY DIMENSIONAL RECORD	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120237	6	0	05/08/92	MECHANICAL MELTER VESSEL ASSEMBLY DIMENSIONAL RECORD	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120238	1	0	08/21/92	BB-130-003,4,5,6 MELTER BUS BARS PARTS LIST & NOTES	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120238	2	0	08/19/92	BB-130-003,4,5,6 MELTER BUS BARS ELECTRODES L2 & L4	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120238	3	0	08/14/92	BB-130-003,4,5,6 MELTER BUS BARS ELECTRODES L1 & L3	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120238	4	0	08/19/92	BB-130-003,4,5,6 MELTER BUS BARS DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120239	1	0	05/11/92	HD-130-002 MELTER FRAME LIFTING YOKE ASSEMBLY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120239	2	0	05/12/92	HD-130-002 MELTER FRAME LIFTING YOKE PARTS DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	1	0	03/31/92	ME-130-001 MELTER RFRC/INSUL PRTS LIST & NOTES	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	2	0	05/05/92	ME-130-001 MELTER RFRC/INSUL ASSEMBLY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	3	0	05/05/92	ME-130-001 MELTER RFRC/INSUL INSTALLATION DIMENSIONS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	4	0	05/05/92	ME-130-001 MELTER RFRC/INSUL INSTALLATION DIMENSIONS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	5	0	05/05/92	ME-130-001 MELTER RFRC/INSUL SUPERSTRUCTURE RFRC	09/28/92	FRP-580	12/18/92	FRP-677

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION, 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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40	P06A	M-2-120242	6	0	03/31/92	ME-130-001 MELTER RFRC/INSUL SUPERSTRUCTURE RFRC	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	7	0	05/05/92	ME-130-001 MELTER RFRC/INSUL SUPERSTRUCTURE RFRC	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	8	0	05/21/92	ME-130-001 MELTER RFRC/INSUL K3 REFRACTORY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	9	0	05/05/92	ME-130-001 MELTER RFRC/INSUL K3 REFRACTORY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	10	0	05/05/92	ME-130-001 MELTER RFRC/INSUL ZIRMUL REFRACTORY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	11	0	05/05/92	ME-130-001 MELTER RFRC/INSUL HEAD LINER DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	12	0	05/05/92	ME-130-001 MELTER RFRC/INSUL. SIDE LINER DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	13	0	03/31/92	ME-130-001 MELTER RFRC/INSUL RING & SLEEVE DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	14	0	06/17/92	ME-130-001 MELTER RFRC/INSUL RISER OUTER INSULATION	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	15	0	06/17/92	ME-130-001 MELTER RFRC/INSUL RISER INNER INSULATION	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	16	0	06/18/92	ME-130-001 MELTER RFRC/INSUL POUR SPOUT OUTER INSUL	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	17	0	05/05/92	ME-130-001 MELTER RFRC/INSUL POUR SPOUT INNER INSUL	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120242	18	0	06/19/92	ME-130-001 MELTER RFRC/INSUL RISER-END DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120249	1	0	02/03/92	ME-130-001 MELTER ARGON FEEDING TUBE ASSEMBLY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120249	2	0	02/11/92	ME-130-001 MELTER ARGON FEEDING TUBE T/C SUPPORT BRACKET	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120249	3	0	02/13/92	ME-130-001 MELTER ARGON FEEDING TUBE PACKING ASSEMBLY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120249	4	0	02/05/92	ME-130-001 MELTER ARGON FEEDING TUBE DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120249	5	0	02/13/92	ME-130-001 MELTER ARGON FEEDING TUBE SECTIONS & DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120365	1	0	04/02/92	ME-130-001 RISER DUMMY HEATER ASSEMBLY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	M-2-120403	1	0	08/29/91	MY-130-001 MELTER SUPPORT BEAM PARTS LIST &	09/28/92	FRP-580	12/18/92	FRP-677

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION, 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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STATUS DATE 12/29/92
CONTRACT 845734

CORDS

DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	DWG REV	SIGNATURE DATE	DRAWING TITLE	FDR DATE	FDR XMTL	AFC DATE	AFC XMTL
						NOTES				
40	P06A	H-2-120403	2	0	03/26/92	MY-130-001 MELTER SUPPORT BEAM ASSEMBLY	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120403	3	0	03/27/92	MY-130-001 MELTER SUPPORT BEAM ASSEMBLY & SECTIONS	09/28/92	FRP-580	12/18/92	FRP-677
40	P06A	H-2-120403	4	0	05/06/92	MY-130-001 MELTER SUPPORT BEAM SECTIONS & DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122420	1	0	08/28/92	ELECTRICAL GENERAL NOTES, SYMBOLS & DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122420	2	0	08/28/92	ELECTRICAL GENERAL NOTES, SYMBOLS & DETAILS	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122421	1	0	08/28/92	ELECTRICAL MELTER VESSEL ASSEMBLY BLOCK DIAGRAM	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122422	1	0	08/28/92	ELECTRICAL CONNECTION DIAGRAM ME-130-001	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122422	2	0	08/28/92	ELECTRICAL CONNECTION DIAGRAM ME-130-001	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122422	3	0	08/28/92	ELECTRICAL CONNECTION DIAGRAM ME-130-001	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122422	4	0	08/28/92	ELECTRICAL CONNECTION DIAGRAM ME-130-001	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122422	5	0	08/28/92	ELECTRICAL CONNECTION DIAGRAM ME-130-001	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122422	6	0	08/28/92	ELECTRICAL CONNECTION DIAGRAM ME-130-001	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122422	7	0	08/28/92	ELECTRICAL CONNECTION DIAGRAM ME-130-001	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122422	8	0	08/28/92	ELECTRICAL CONNECTION DIAGRAM ME-130-001	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122422	9	0	08/28/92	ELECTRICAL CONNECTION DIAGRAM ME-130-001	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122422	10	0	08/28/92	ELECTRICAL CONNECTION DIAGRAM ME-130-001	09/28/92	FRP-580	12/18/92	FRP-677
60	P06A	H-2-122422	11	0	08/28/92	ELECTRICAL CONNECTION DIAGRAM ME-130-001	09/28/92	FRP-580	12/18/92	FRP-677

TOTAL: 125

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION, 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

MELTER VESSEL ASSEMBLY

Specification B-595-P-P06A

"APPROVED FOR CONSTRUCTION"

Revision No. 0

Issue Date 12/18/92

APPROVED BY:

J. M. Ganzen	Project Package Engineer	12/18/92 Date
R. M. Keenan (R L Robertson for R M Keenan)	Area Project Manager	12/18/92 Date
P. J. Speddel	Project Engineering Manager	12/18/92 Date
J. L. Smets	Systems Manager	12/18/92 Date
A. K. Yee (J S Martin FOR A. K. YEE)	Independent Safety Manager	12/18/92 Date
J. G. Kelly	Quality Assurance Manager	18 DEC 92 Date
R. S. Poulter	Project Director	Date

MELTER VESSEL ASSEMBLY
(B-595-P-P06A)

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DIVISION 17 - CONTROLS AND INSTRUMENTATION

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 01730
OPERATION AND MAINTENANCE DATA
B-595-P-P06A-01730

APPROVED FOR CONSTRUCTION

9413199.0607

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3__ 4 X

ORIGINATOR:

J. R. Morey for JR Morey 12/18/92
J. R. Morey, Specification Writer Date

CHECKER:

D. A. Buzzelli 12-18-92
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

C. J. Divona
C. J. Divona Lead Discipline Engineer

12-18-92
Date

12/18/92 8:19am
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SECTION 01730
OPERATION AND MAINTENANCE DATA
B-595-P-P06A-01730

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SECTION 01730
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit operation and maintenance (O&M) data which is specifically applicable to this contract and a complete and concise depiction of the provided equipment or product. Data containing extraneous information to be sorted through to find applicable instructions will not be accepted. Present information in sufficient detail to clearly explain user O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/ Subcontract.

1.1.1 Package Content

For each product, system, or piece of equipment requiring submission of O&M data, submit the package required in the individual technical section. Package content shall be as required in the Paragraph 1.3, "Schedule of Operations and Maintenance Data Packages."

1.2 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

1.2.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation:

1.2.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

1.2.1.2 Operator Prestart

Include requirements to set up and prepare each system for use.

1.2.1.3 Start-Up, Shutdown, and Post-Shutdown Procedures

Include a control sequence for each of these operations.

1.2.1.4 Normal Operations

Include control diagrams with data to explain operation and control of systems and specific equipment.

1.2.1.5 Emergency Operations

Include emergency procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include emergency shutdown instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance on emergency operations of all utility systems including valve locations and portions of systems controlled.

1.2.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustments, and inspection.

1.2.1.7 Environmental Conditions

Include a list of environmental conditions (temperature, humidity, and other relevant data) which are best suited for each product or piece of equipment and describe conditions under which equipment should not be allowed to run.

1.2.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair.

1.2.2.1 Lubrication Data

Include lubrication data, other than instructions for lubrication in accordance with Paragraph 1.2.1.6, Operator Service Requirements.

1.2.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair. Provide manufacturer's projection of preventive maintenance man-hours on a daily, weekly, monthly, and annual basis.

1.2.3 Corrective Maintenance

Include manufacturer's recommendations on procedures and instructions for correcting problems and making repairs.

1.2.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or

inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.2.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation numbering.

1.2.3.3 Maintenance and Repair Procedures

Include instructions and list tools required to restore product or equipment to proper condition or operating standards.

1.2.3.4 Removal and Replacement Instructions

Include step-by-step procedures and list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

1.2.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays.

1.2.3.6 Corrective Maintenance Man-Hours

Include manufacturer's projection of corrective maintenance man-hours. Corrective maintenance that requires participation of the equipment manufacturer shall be identified and tabulated separately.

1.2.4 Appendices

Provide information specified in the preceding paragraphs pertinent to the maintenance or operation of the product or equipment. Include the following:

1.2.4.1 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify

parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number which will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies.

A. Manufacturer's Standard Commercial Practice: The parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as a master parts catalog, in accordance with the manufacturer's standard commercial practice.

B. Other Than Manufacturer's Standard Commercial Practice (MSCP): End item manufacturer may add a cross-reference to implement components' assemblies and parts requirements when implementation in manual form varies significantly from the style, format, and method of manufacturer's standard commercial practice. Use the format in the following example:

End Item Manufacturer's Alphanumeric Sequence	Actual Manufacturer's Name and MSCP	Actual Manufacturer Part No.
100001	John Doe & Co. 00000	2000002

1.2.4.2 Warranty Information

List and explain the various warranties and include the servicing and technical precautions prescribed by the manufacturers or contract documents to keep warranties in force.

1.2.4.3 Personnel Training Requirements

Provide information available from the manufacturers to use in training designated personnel to operate and maintain the equipment and systems properly.

1.2.4.4 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

1.3 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

1.3.1 Data Package

A. Operating instructions

B. Safety precautions

C. Operation prestart

D. Start-up, shutdown, and post shutdown

E. Normal operations

F. Emergency operations

G. Operator Service Requirements

H. Environmental conditions

I. Preventative maintenance

J. Lubrication data

K. Preventive maintenance plan and schedule

L. Corrective maintenance

M. Troubleshooting guides and diagnostic techniques

N. Wiring diagrams and control diagrams

O. Maintenance and repair procedures and manhour requirements

P. Removal and replacement instructions

Q. Spare parts and supply list

R. Parts identification

S. Warranty information

T. Personnel training requirements

U. Testing equipment and special tool information

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 05010
MODIFIED INCONEL ALLOY 690 MATERIAL
B-595-P-P06A-05010

APPROVED FOR CONSTRUCTION

9413199.0615

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3X 4__

ORIGINATOR(S):

C. J. Divona for
R. Hulskamp, Mechanical Engineer

CHECKER(S):

D. A. Buzzelli 12-18-92
D. A. Buzzelli, Lead Discipline Checker

APPROVED BY:

C. J. Divona 12-18-92
C. J. Divona Lead Discipline Engineer Date

12/17/92 8:34pm
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SECTION 05010
MODIFIED INCONEL ALLOY 690 MATERIAL
B-595-P-P06A-05010

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ATTACHMENTS

SECTION 05010
MODIFIED INCONEL ALLOY 690 MATERIAL

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the requirements for quantity, configuration, chemical and physical properties, testing and certification of modified Alloy UNS N06690 (Inconel 690) material in accordance with ASTM B166, B167 and B168.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B166	1990 Standard Specification for Nickel-Chromium-Iron Alloys (UNS N06600, N06601, and N06690) Rod, Bar, and Wire.
ASTM B167	1990 Standard Specification for Nickel-Chromium-Iron Alloys (UNS N06600, N06601, and N06690) Seamless Pipe and Tube.
ASTM B168	1991 Standard Specification for Nickel-Chromium-Iron Alloys (UNS N06600, N06601, and N06690) Plate, Sheet, and Strip.
ASTM E587	1982 Standard Practice for Ultrasonic Angle-Beam Examination by the Contact Method.

1.3 RELATED REQUIREMENTS

Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys.

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

This material will be used to fabricate heating elements, instruments and other critical sub-assemblies which will control and monitor the performance of a glass melter. The melter will be operated in the Hanford Waste Vitrification Plant (HWVP).

The melter assembly consists of internal insulation, refractory lining and auxiliary equipment as fabricated from Inconel 690. This alloy was selected based on the following unique operating conditions of the HWVP melter:

A. Once started-up, the melter must operate continuously for several years and as a minimum for 2 years. Some of the Inconel 690 assemblies are a permanent part of the melter and cannot be repaired or replaced after start-up. Premature failure of these items would require the entire melter to be removed from service.

B. Inconel 690 will be subjected to a very corrosive environment at temperatures up to 1170 °C.

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Certifications

Certified Material Test Reports (CMTRs) shall be submitted for Buyer's review. CMTRs shall be traceable to each heat number. The CMTRs shall include the standard certification data required by ASTM B166, ASTM B167 and ASTM B168. Specific emphasis shall be placed on the following:

A. Chemical composition for each heat. Refer to Paragraph 2.1.2.1.

B. Physical properties for each heat. Refer to Paragraph 2.1.2.2.

C. Grain size for each item. Refer to Paragraph 2.1.2.3.

D. Ultrasonic test results for each item. Refer to Paragraph 2.1.2.5.

1.6.2 Seller shall prepare and submit for Buyer approval ultrasonic testing procedures for bar stock, plate, rod material, tube, sheet and pipe. These procedures shall be used in support of Paragraph 2.1.2.5. They shall be prepared in accordance with ASTM E587.

1.6.3 Seller shall submit recommended storage and handling procedures for Buyer approval.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Quantities and Configurations

All material shall be delivered in the sizes, configurations and quantities as listed in Attachment A.

2.1.1.1 All material shall be clearly segregated, protected, controlled, marked and stored in accordance with Specification Section 13252. Marking shall be in accordance with Paragraph 2.2.1. All stainless steel and nickel-based alloy materials shall be identified with a heat number prior to and during fabrication. Material withdrawal and use shall be made only against written procedures. No unauthorized persons shall have access to material. There shall be no possibility of mixing materials. Materials for other jobs shall not be stored in the same area.

2.1.2 Chemical and Physical Properties

All material shall be Alloy UNS N06690 in accordance with ASTM B166, ASTM B167 and ASTM B168 modified as follows.

2.1.2.1 Chemical Composition

It has been determined that the corrosion resistance of Alloy 690, in this application, is sensitive to chromium content. Therefore, all material on this order shall be in accordance with the chemical composition requirements of ASTM B166, ASTM B167 and ASTM B168, except that the chromium content shall be not less than 29% by weight.

The chemical composition by weight percentage values shall be as follows:

A.	Chromium:	29.0 to 31.0
B.	Nickel:	58.0 minimum
C.	Iron:	7.0 to 11.0
D.	Manganese:	0.50 maximum

E.	Copper:	0.50 maximum
F.	Silicon:	0.50 maximum
G.	Carbon:	0.05 maximum
H.	Sulfur:	0.015 maximum

2.1.2.2 Physical Properties

After solution annealing, the following mechanical properties shall be determined for each heat.

A. Elongation (this shall be 30% min. in 2")

B. Ultimate Tensile Strength

C. Yield Strength

D. Reduction of Area

2.1.2.3 Grain Size

The average grain size of all items (plates, sheets, bars, pipes, etc.) shall be determined after solution annealing. The grain size shall be ASTM Avg #5 or finer.

2.1.2.4 Condition

All material shall be solution annealed and finished as follows:

A. All bar stock and rod material shall be hot finished, rough turned or rough ground and annealed.

B. All pipe shall be hot finished, descaled and annealed.

C. All tubes shall be cold drawn, descaled and annealed.

D. All plate shall be hot rolled, descaled and annealed.

E. All sheet shall be cold rolled, descaled and annealed.

2.1.2.5 Ultrasonic Testing

All items (plates, sheets, bars, pipes, etc.) in each heat lot shall be ultrasonically tested in accordance with Buyer-approved procedures. No pits, voids, inclusions, cracks or splits shall be permitted.

These tests shall be carried out on descaled surfaces prior to solution annealing.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 Identification Marking

All items shall be identified by a continuous marking method in accordance with ASTM B166, ASTM B167 and ASTM B168. The following information shall be included:

A. UNS Alloy No.
B. Inconel 690
C. Heat Number
D. Lot Number
E. Buyer Purchase Order Number

A vibrotool may be used to mark this information only where continuous marking is physically impossible.

2.2.2 Shipping

All material on this order including any excess material from each heat shall be divided, sorted and shipped to various fabrication vendors who are under separate contracts with Buyer. Detailed instructions for sorting, tagging and shipping will be furnished by Buyer.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

CUT LIST FOR INCONEL 690 MATERIAL FOR ONE MELTER ASSEMBLY

NOZZLES A & T

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Flange	Plate	3.00 THK x 17.50 x 26.50	3
Nozzle-Neck	Pipe	ϕ11.00 x ϕ7.00 x 16.00 LG.	3

RISER/POUR SPOUT HEATER - CORE

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Inclined section	Rod	ϕ8.50 x 63.00 LG.	2
Vertical section	Rod	ϕ5.50 x 28.00 LG.	2
Intersection	Bar	8.50 x 10.50 x 18.00	2
Fitting		Fall-off elsewhere	

INCONEL DAM ASSEMBLY

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Inner Fitting	Plate	3.00 THK x ϕ15.00	2
Tube	Tube	12.50 OD x .50 WALL x 20 LG.	2
Inner Flange	Plate	.50 THK x 20.00 SQ	2
Inner Cone	Plate	.25 THK x 6.00 x 54.00	2
Outer Cone	Plate	.25 THK x 8.00 x 54.00	2
Outer Flange	Plate	.25 THK x ϕ28.00	2

RISER/POUR SPOUT - DETAILS

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Shield (Tube)	Tube	4.25 OD x .19 WALL x 6.50 LG.	2
Shield (Flange)	Sheet	.19 x 10.0 x 10.0	2

DOME HEATERS

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Heater Element Flanged Sleeve	Pipe	ϕ3.50 x ϕ2.50 x 27.00 LG.	10
Heater Element Center Section	Pipe	ϕ3.50 x ϕ2.00 x 74.00 LG.	10
Heater Element Stepped Section	Pipe	ϕ3.50 x ϕ2.00 x 30.00 LG.	10
Heater Element Flange Plate	Plate	1.00 THK x 8.00 SQ	10
Jumpers	Bar	5.00 x 6.50 x 13.5	5

ATTACHMENT A (CONTINUED)

LEVEL INDICATOR DIP TUBES

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Random Tube Sections	Rod	ϕ3.75 x 71.00 LG.	4
Connector Flange	Plate	2.00 THK x ϕ6.00	2
Bracket (under flange)	Plate	.75 THK x 12.00 x 12.00	2
Gussets (for bracket)	Plate	.50 THK x 3.00 x 8.00	2
Trunnion Pads	Rod	ϕ2.00 x 1.50 LG.	2
Cam Pad	Plate	1.00 THK x 3.00 x 4.00	2

T/C CONDUCTIVITY PROBE

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Thermowell Tube	Rod	ϕ3.75 x 72.00 LG.	2
Tube Flange	Bar	8.00 x 7.50 x 8.00	2

T/C NOZZLE C-4

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Thermowell Tube	Rod	ϕ3.75 x 114.00 LG.	2
Tube Flange	Bar	8.00 x 7.50 x 8.00	2

T/C NOZZLE E

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Thermowell Tube	Rod	ϕ3.75 x 114.00 LG.	2
Tube Flange	Bar	8.00 x 7.50 x 8.00	2

COMMON MISCELLANEOUS PARTS

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Support Sleeve	Rod	ϕ5.00 x 7.00 LG.	6
Retainer	Rod	ϕ5.00 x 3.00 LG.	6

ATTACHMENT A (CONTINUED)

BOROSCOPE TV

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Boroscope Tube	Tube	ϕ4.00 x ϕ2.50 x 29.00 LG.	3
Bottom Cap	Plate	2.25 THK x ϕ4.00	3
Top Fitting	Plate	2.25 THK x ϕ6.50	3

FEED TUBES

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Insulation Cover	Tube	ϕ3.38 x .160 WALL x 57.00 LG.	3
Insulation Cover Ring	Plate	.18 THK x ϕ4.00	3
Bottom Cap	Rod	ϕ3.75 x 6.00 LG.	3
Support Sleeve	Rod	ϕ5.00 x 8.00 LG.	3
Retainer	Rod	ϕ5.00 x 4.00 LG.	3

FILM COOLER "A" NOZZLE

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Lower Base Plate	Plate	3.00 THK x 16.00 x 27.00	2
Inner Base Plate	Plate	1.00 THK x 15.00 x 15.00	2
Outer Sleeve	Pipe	ϕ8.00 x ϕ6.50 x 26.00 LG.	2
Circular Bevels	Pipe	ϕ6.50 x ϕ5.00 x 48.00 LG.	2
End Ring	Plate	1.25 THK x 10.00 x 10.00	2
Bevel Support/Spacer	Sheet	.14 THK x 48.00 x 48.00	2
End Stops		FALL-OFF ELSEWHERE	2

FILM COOLER "T" NOZZLE

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Lower Base Plate	Plate	3.00 THK x 16.00 x 27.00	2
Inner Base Plate	Plate	1.00 THK x 15.00 x 15.00	2
Outer Sleeve	Pipe	ϕ8.00 x ϕ6.50 x 26.00 LG.	2
Inner Sleeve	Pipe	ϕ6.50 x ϕ5.00 x 48.00 LG.	2
End Ring	Plate	.50 THK x 10.00 x 10.00	2
End Stops		FALL-OFF ELSEWHERE	2

ATTACHMENT A (CONTINUED)

ELECTRODES

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
End Plate	Plate	4.00 THK x 16.00 x 41.00	6
Lead	Rod	ϕ5.00 x 15.00 LG.	6
Lead	Rod	ϕ5.00 x 25.00 LG.	6

OFF-GAS BRUSH

ITEM DESCRIPTION	FORM	MAKE FROM	QTY
Retainer	Plate	.25 THK x ϕ6.00 LG	3
Housing	Plate	4.00 THK x ϕ13.00	3
Retainer	Plate	.50 THK x ϕ6.00	3
Tube	Tube	ϕ2.083 x ϕ1.706 x 55.00 LG.	3
Tube Flange	Plate	.50 THK x ϕ4.00	3

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 05011
MODIFIED INCONEL ALLOY 690 WELD WIRE
B-595-P-P06A-05011

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3 X 4__

ORIGINATOR:

C J Divona for
R. Hulskamp, Mech. Engineer Date

CHECKER:

Dale A. Buzzelli 12-18-92
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

C J Divona
C. J. Divona Lead Discipline Engineer

12-18-92
Date

12/17/92 8:11pm
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SECTION 05011
MODIFIED INCONEL ALLOY 690 WELD WIRE
B-595-P-P06A-05011

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SECTION 05011
MODIFIED INCONEL ALLOY 690 WELD WIRE

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the requirements for quantity, size, chemical composition and certification of Modified Alloy UNS N06690 welding material. This material shall be used for the welding of modified Alloy UNS N06690 base material to like material, to Type 304L stainless steel and to Nickel 200 material.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS A5.14	1989 Nickel and Nickel Alloy Bare Welding Electrodes and Rods

1.3 RELATED REQUIREMENTS

(Not Used)

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

This material will be used in the fabrication of heating elements, instruments and other critical sub-assemblies which will control and monitor the performance of a glass melter. The melter will be operated in the Hanford Waste Vitrification Plant (HWVP).

The melter assembly consists of internal insulation, refractory lining and auxiliary equipment as fabricated from Inconel 690. This alloy was selected based on the following unique operating conditions of the HWVP melter:

A. Once started-up, the melter must operate continuously for several years. Some of the Inconel 690 assemblies are a permanent part of the melter and cannot be repaired or replaced after start-up. Premature failure of these items would require the entire melter to be removed from service.

B. Inconel 690 will be subjected to a very corrosive environment at temperatures up to 1170 °C.

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Seller shall prepare and submit, for Buyer's review, a Certified Material Test Report (CMTR) for each heat. These CMTRs shall be in accordance with Paragraph 16 of AWS A5.14. Chemical composition shall be in accordance with Paragraph 2.1.2.1.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Quantities and Sizes

The following sizes and amounts of weld wire shall be delivered:

A. .062" diameter (180) lbs.

B. .093" diameter (1300) lbs.

C. .125" diameter (1200) lbs.

2.1.2 Chemical and Physical Properties

2.1.2.1 Chemical Composition

It has been determined that the corrosion resistance of Alloy 690, in this application, is sensitive to chromium content. Therefore, all weld wire on this order shall be processed in accordance with AWS A5.14 Classification ERNiCrMo-3 (UNS N06625). Exception: the required chemical composition resembles that of Alloy 690 with chromium content not less than 30% by weight.

The modified chemical composition by weight percentage values shall be as follows:

Chromium:	30.0 to 32.0
Nickel:	Balance
Iron:	8.0 to 11.0
Carbon:	0.02 to 0.08
Manganese:	0.05 to 0.30
Silicon:	0.05 to 0.30
Aluminum:	0.50 to 1.10
Titanium:	0.20 to 0.70
Copper:	0.50 maximum
Oxygen:	0.0100 maximum
Hydrogen:	0.0010 maximum
Nitrogen:	0.0100 maximum
Magnesium:	Add .03
Boron:	None added
Sulfur:	0.015 maximum
Phosphorus:	0.015 maximum
Lead:	0.001 maximum

2.2 FABRICATION AND MANUFACTURE

2.2.1 Identification Marking

Identification, packaging and marking shall be in accordance with AWS A5.14, Paragraphs 11, 12 and 13. Exception: all markings shall include the following additional information:

Buyer Purchase Order No.
Project: HWVP
Weld Wire for Alloy 690

2.2.2 Packaging and Shipping

The weld wire on this order shall be divided, sorted and shipped to various fabrication vendors who are under separate contracts with the Buyer. Detailed instructions for sorting and shipping destinations will be furnished by Buyer.

2.2.2.1 The .062" diameter weld wire shall be delivered on spools. These spools shall be approximately 12 inches in diameter. Each spool shall contain not more than 25 pounds of weld wire.

2.2.2.2 The .093" and .125" diameter weld wire shall be delivered in straight lengths of 36 inches. These lengths of wire shall be packed in standard packages. Each package shall contain not more than 10 pounds of weld wire.

PART 3 EXECUTION

(Not Used)

END OF SECTION

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 05060
WELDING STRUCTURAL
B-595-P-P06A-05060

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3 X 4__

ORIGINATOR:

A. Estrada, Welding Engineer 12/18/92 Date

CHECKER:

D. A. Buzzelli, Lead Disc. Checker 12-18-92 Date

APPROVED BY:

C. J. Divona Lead Discipline Engineer 12-18-92 Date

SECTION 05060
WELDING STRUCTURAL
B-595-P-P06A-05060

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SECTION 05060
WELDING STRUCTURAL

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the welding, examination and testing requirements for fabrication of carbon steel and stainless steel structural shapes.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Codes

ASME Section II, Part C	1989 Material Specification - Welding Rods, Electrodes, and Filler Metals
ASME Section VIII, Division 1	1989 Rules for Construction of Pressure Vessels
ASME Section IX	1989 Welding and Brazing Qualification

AMERICAN SOCIETY OF NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A	1988 Recommended Practice - Personnel Qualification and Certification in Nondestructive Testing

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	1990 Structural Welding Code
AWS D9.1	1990 Sheet Metal Welding Code

1.3 RELATED REQUIREMENTS

Specification Section 13252	Precautions for the Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys

1.4 **DEFINITIONS**

(Not Used)

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Welding Procedure Specifications and Procedure Qualification Records shall be submitted for Buyer approval. This requirement shall also pertain to purchased items contracted by Seller. They shall be in accordance both with the requirements of AWS D1.1 or ASME Section IX and this specification section. Seller shall review the contractor's procedures to verify their conformance to the requirements of this specification section.

1.6.2 Welder Performance Qualifications shall be submitted for Buyer review. This requirement shall also pertain to purchased items contracted by Seller. They shall be in accordance both with AWS D1.1 or ASME Section IX and this specification section.

1.6.3 Certified Material Test Reports (CMTRs) for weld filler metal shall be submitted for Buyer review.

1.6.4 Weld repair procedures shall be submitted for Buyer approval in accordance with Paragraph 3.4.1.

1.6.5 Final weld examination and inspection reports shall be submitted for Buyer review. These shall include visual nondestructive examination (NDE) reports and radiography film.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Matching weld filler materials shall be in accordance either with AWS D1.1, Table 4.1 or AWS D9.1, Appendix A. For carbon steel, a minimum 70 ksi filler metal shall be used.

2.1.2 Weld filler materials shall be used so that the principal elements in the deposited weld metal shall be of the same nominal composition as the base metal (Example: for Type 304L stainless steel, use AWS classification E/ER 308L filler material).

2.1.3 Solid wires for automatic welding processes shall contain the principal alloying elements required for the deposited weld metal. Welds deposited by the submerged arc process shall not derive any principal alloying elements from the flux.

2.1.4 Fluxes that the flux manufacturer recommends for single-pass shall not be used for multiple-pass welds.

2.1.5 Submerged arc welding shall be performed using both the same name brand flux and the same name brand of AWS classification wire as used for the procedure qualifications.

2.1.6 Storage and handling of electrodes, fluxes and other welding material after shipping containers are opened shall be in accordance with Seller's filler materials control procedure. This procedure shall follow the guidelines of AWS D1.1, ASME Section II, Part C and the filler metal manufacturer's recommendations.

2.1.7 Tack welds shall be made with the equivalent type of filler wire that is used for the root pass.

2.1.8 Temporary backup rings or strips, when required on the Contract Drawings, shall be of the same nominal composition as the base material.

2.1.9 For dissimilar joints in base materials consisting of carbon steel on one side and austenitic stainless on the other, the filler metal shall be AWS classification E/ER 309L.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 General Requirements

2.2.1.1 Fabrication shall be in accordance with the requirements of AWS D1.1 Section 8.

2.2.1.2 Cleanliness shall be maintained during welding. All stubs, rods, flux, slag and other foreign material shall be removed from the weld area.

2.2.1.3 All arc strikes, weld spatter, burrs, etc. shall be ground to a smooth contour.

2.2.1.4 Tack welds in open butt joints shall be feathered into surrounding material. Cracked tack welds shall be removed.

2.2.2 Welding Qualifications

2.2.2.1 Welding procedures, welders, welding operators and tackers shall be qualified in accordance either with AWS D1.1 or ASME Section IX. ASME Section IX, Welder Performance Qualification, may be used in lieu of AWS D1.1 qualifications.

2.2.2.2 Any welder shall be retested and recertified when the work of said welder creates a reasonable doubt as to the quality of his/her workmanship.

2.2.2.3 The format of Welding Procedure Specifications shall be in accordance either with Appendix E of AWS D1.1, Appendix A of ASME Section IX or equivalent. This shall include Prequalified Welding Procedure Specifications, Procedure Qualification Records and nondestructive examination reports.

2.2.2.4 Welding shall not start until Welding Procedure Specifications (including Prequalified Welding Procedure Specifications), Procedure Qualification Records and Weld Repair Procedure are returned to the Seller from the Buyer with authorization to proceed. Welds performed by procedures or personnel differing from those authorized are subject to complete removal.

2.2.3 Acceptable Welding Processes

2.2.3.1 Welding may be achieved by any one or combination of the following welding processes:

Welding Process	AWS Letter Designation
Shielded Metal Arc Welding	SMAW
Flux-Cored Arc Welding	FCAW
Automatic Submerged Arc Welding	SAW

2.2.3.2 Other welding processes such as Gas Metal Arc or Manual Submerged Arc require specific written authorization by the Buyer. Submit all pertinent data and intended application of said process for evaluation.

PART 3 EXECUTION

3.1 **PREPARATION**

3.1.1 Weld joint preparation shall be made by machining, grinding or thermal cutting. When thermal cutting is performed the joint surfaces shall be ground to bright metal prior to welding. Oxy-

fuel thermal cutting shall not be used for joint preparation of stainless steel.

3.1.2 For structural tubular welds, longitudinal weld seams shall be parallel to the longitudinal axis and shall be complete (100 percent) penetration butt welds. Longitudinal seams of adjoining tubular members shall not be in line but shall be offset from other longitudinal seams by not less than five (5) times the wall thickness of the tubular component.

3.1.3 Permanent backup strips or backing rings are not permitted without specific written authorization from the Buyer. If temporary backup strips are used and then removed, the weld area shall be dressed and examined for cracks and other defects. Examination of the area shall be performed both visually and by either magnetic particle or liquid penetrant method. Examination shall be in accordance with Paragraph 3.2.5.

3.1.4 The parts to be joined shall be in accordance with the assembly requirements of AWS D1.1.

3.1.5 All surfaces to be welded shall be free of paint, oil, dirt, scale, oxides and other foreign materials detrimental to weld soundness.

3.1.6 For stainless steel, joint edges and adjacent surfaces to be welded shall be wire brushed. They shall be cleaned with an ethyl alcohol or acetone dampened lint-free cloth before welding begins.

3.1.7 Wire brushes used on stainless steel welds shall be made of 300 series austenitic stainless steel. Mechanical cleaning tools used on stainless steel such as grinding wheels, files, deburring tools and wire brushes shall be clearly marked. Marking shall identify tools to be used on stainless steel only.

3.1.8 Grinding shall be done in such a method that overheating of stainless steel base and weld metal is minimized. Abrasive disks and abrasive flapper wheels are preferred over grinding disk or continuous-belt grinders.

3.1.9 To minimize the contamination of stainless steel, Seller shall follow the requirement of Specification Section 13252 prior to and after welding.

3.2 **INSTALLATION, APPLICATION and ERECTION**

3.2.1 All welds shall be made in accordance both with Contract Documents and Seller's fabrication drawings.

3.2.2 Flux, weld spatter and any slag shall be removed from each weld bead prior to depositing each succeeding pass.

3.2.3 Welding starts and stops in welds shall be held to a minimum. Each such stop shall be properly conditioned before continuing the weld. The use of starting and stopping plates is recommended where possible.

3.2.4 Preheat and Interpass Temperature Control

3.2.4.1 For carbon steel the preheat and interpass temperature shall be in accordance with AWS D1.1 Paragraph 4.2.

3.2.4.2 For austenitic stainless steel the minimum preheat shall be 50°F. Interpass temperature shall not exceed 350°F.

3.2.5 Inspection and Nondestructive Examination

Specific nondestructive examination (NDE) shall be performed in accordance both with Contract Documents and Seller's fabrication drawings. NDE methods, acceptance criteria and additional general requirements shall be in accordance with the following subparagraphs. All NDE, except visual examination, shall be performed by personnel certified in accordance with ASNT SNT-TC-1A.

3.2.5.1 Inspection

A. The welding inspector shall be qualified and certified in accordance with AWS D1.1, Paragraph 6.1.3.

B. All weld inspection reports shall be submitted in accordance with Paragraph 1.6.

3.2.5.2 Visual Examination (VT)

A. Visual examination shall be performed in accordance both with AWS D1.1, Section 6 and this specification section.

B. Seller shall visually inspect all completed welds in accordance with AWS D1.1, Paragraph 8.15.1. Weld profiles shall be in accordance with AWS D1.1, Figure 3.4. Defective welds shall be repaired in accordance with Seller's approved weld repair procedures.

C. Visual examination shall be performed on all ground and blended welds. This is in addition to visual examination of the completed weld.

D. For butt joints, the weld metal on the front surface shall not be lower than the adjacent base metal surfaces.

E. Groove welds shall have a uniform transition from the joined material into the weld deposit. They shall be free of undercut and unfused overlap of the weld deposit.

F. Fillet weld surfaces shall have a uniform transition from the base material into the weld deposit. They shall be free of undercut and unfused overlap of the weld deposit.

3.2.5.3 Liquid Penetrant Examination (PT)

Liquid penetrant examination shall be in accordance with AWS D1.1, Paragraph 6.7.7, when required by the Contract Documents. Acceptance criteria shall be in accordance with AWS D1.1, Paragraph 8.15.5.

3.2.5.4 Radiographic Examination (RT)

Radiographic examination shall be in accordance with AWS D1.1, Paragraph 6.9, when required by the Contract Documents. Acceptance criteria shall be in accordance with AWS D1.1, Paragraph 8.15.2.

3.2.5.5 Magnetic Particle Examination (MT)

Magnetic particle examination shall be in accordance with AWS D1.1, Section 6.7.6, when required by the Contract Documents. Acceptance criteria shall be in accordance with AWS D1.1, Section 8.15.5.

3.2.5.6 Ultrasonic Examination (UT)

Ultrasonic examination shall be in accordance with AWS D1.1, Chapter 6, Part C, when required by the Contract Documents. Acceptance criteria shall be in accordance with AWS D1.1, Section 8.15.4.

3.2.6 Stress Relief Heat Treatment

3.2.6.1 Stress relief heat treatment shall be in accordance with AWS D1.1, Section 4.4. Exception: alternate stress relief times and temperatures permitted by Table 4.5 shall not be used.

3.2.6.2 Stress relief heat treatment for purpose of dimensional stability is not acceptable for kick plates with duplex stainless steel remote connector nozzles.

3.2.7 Charpy Impact Testing

3.2.7.1 Procedure Qualification Record (PQR)

A. Testing is only required when welding duplex stainless steel remote connector nozzles to stainless steel kick plates.

B. Deposited weld metal and both heat affected zones shall be tested with results recorded on the PQR.

C. Testing shall be in accordance with ASME Section VIII, Paragraph UG-84.

D. The minimum impact energy shall be 18 ft.-lbs. at room temperature.

3.3 **FIELD QUALITY CONTROL**

(Not Used)

3.4 **ADJUSTMENTS**

3.4.1 Weld Repairs

3.4.1.1 All weld repairs shall be performed in accordance with approved weld repair procedures.

3.4.1.2 Unacceptable indications shall be completely removed by chipping gouging, grinding or other authorized methods (for the type of material being repaired) to clean, bright metal. The excavated areas shall then be examined either by the liquid penetrant or magnetic particle method to assure complete removal of defects. Liquid penetrant examination shall be in accordance with Paragraph 3.2.5.

3.4.1.3 The repaired areas shall be reexamined using the same inspection procedures by which the defect was originally detected, along with all other inspection called out for the particular weld.

3.4.1.4 Two repair attempts will be allowed on any one defective area. No further repair attempts shall be carried out without the authorization of the Buyer.

3.5 **CLEANING**

(Not Used)

3.6 **PROTECTION**

(Not Used)

3.7 **DEMONSTRATION**

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 05063
WELDING PRESSURE VESSELS
B-595-P-P06A-05063

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1___ 2___ 3 X 4___

ORIGINATOR:

A. Estrada, Welding Engineer — Date 12/8/92

CHECKER:

D. A. Buzzelli, Lead Disc. Checker — Date 12-18-92

APPROVED BY:

C. J. Divona — Lead Discipline Engineer — Date 12-18-92

SECTION 05063
WELDING PRESSURE VESSELS
B-595-P-P06A-05063

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ATTACHMENTS

SECTION 05063
WELDING PRESSURE VESSELS

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the welding, examination and testing requirements for shop fabrication of melter vessel and associated piping. The material of construction shall be Type 304L stainless steel, duplex stainless steel (CD4MCU), nickel alloy and UNS N06690 (Modified Inconel 690).

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B31.3	1990 Chemical Plant and Petroleum Refinery Piping

Boiler and Pressure Vessel Codes

ASME Section II, Part C	1989 Material Specification - Welding Rods, Electrodes, and Filler Metals
ASME Section V	1989 Nondestructive Examination
ASME Section VIII, Division 1	1989 Pressure Vessels
ASME Section IX	1989 Welding and Brazing Qualification

AMERICAN SOCIETY OF NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A	1988 Recommended Practice - Personnel Qualifications and Certification in Nondestructive Testing

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	1986 Standard Symbols for Welding, Brazing and Nondestructive Testing

AWS A3.0	1989 Welding Terms and Definitions
AWS D10.11	1987 Recommended Practice for Root Pass Welding of Pipe without Backing
AWS QC1	1988 Standard and Guide for Qualification and Certification of Welding Inspectors

1.3 **RELATED REQUIREMENTS**

Specification Section 05010	Modified Inconel Alloy 690 Material
Specification Section 05011	Modified Inconel Alloy 690 Weld Wire
Specification Section 13252	Precautions for the Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys

1.4 **DEFINITIONS**

CMTR - Certified Material Test Report

NDE - Nondestructive Examination

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Welding Procedure Specifications (ASME Form QW-482 or equivalent) and Procedure Qualification Records (ASME Form QW-483 or equivalent) shall be submitted for Buyer approval. This requirement shall also pertain to purchased items contracted by Seller. They shall be in accordance both with the requirements of ASME Section IX and this specification section. Seller shall review the contractor's procedures to verify their conformance to the requirements of this specification section.

1.6.2 Welder Performance Qualifications (ASME Form QW-484 or equivalent) shall be submitted for Buyer review. This requirement shall also pertain to purchased items contracted by Seller.

1.6.3 Certified Material Test Reports (CMTRs) for weld filler metal shall be submitted for Buyer review.

1.6.4 Weld repair procedures shall be submitted for Buyer approval in accordance with Paragraph 3.4.1.

1.6.5 Final nondestructive examination (NDE) and inspection reports shall be submitted for Buyer review. These shall include visual inspection reports and radiography film.

1.6.6 Weld maps and weld procedure summary sheets shall be submitted for Buyer approval. They specifically identify each weld joint, weld procedure to be used and NDE requirement (see Attachment A and Attachment B for sample forms).

1.6.7 Attachment C (Form E-651) summarizing application of individual welding procedures with regards to types of joints and piping material line class shall be submitted for Buyer approval.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Weld filler materials shall be in accordance with ASME Section II, Part C.

2.1.2 Weld filler materials shall be used so that the principal elements in the deposited weld metal shall be of the same nominal composition as the base metal.

2.1.3 Solid wires for automatic welding processes shall contain the principal alloying elements required for the deposited weld metal. Welds deposited by the submerged arc process shall not derive any principal element from the flux.

2.1.4 Fluxes that the flux manufacturer recommends for single-pass shall not be used for multiple-pass welds.

2.1.5 Submerged arc welding shall be performed using the same name brand flux and the same name brand of ASME classification wire as used for the procedure qualifications.

2.1.6 Storage and handling of electrodes, fluxes and other welding materials after shipping containers are opened shall be in accordance with Seller's filler material control procedure. This

procedure shall be in accordance with the guidelines of ASME Section II, Part C and the filler metal manufacturer's recommendation. At minimum, nickel alloy-covered electrode shall be stored in an electrode oven before use. Oven temperature shall be between 200°F and 300°F, inclusive.

2.1.7 Tack welds shall be made with the equivalent type of electrode filler wire that is used for the root pass.

2.1.8 Filler metal for welding Modified Inconel 690 shall be in accordance with Specification Section 05011.

2.1.9 For dissimilar welding between Type 304L stainless steel and duplex stainless steel nozzles the filler metal shall be duplex filler metal.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 General Requirements

2.2.1.1 Fabrication to this specification section shall be in accordance with the requirements of ASME Section VIII, Division 1 for vessels and ASME B31.3 for piping. Compliance with this specification section and authorization of Welding Procedure Specifications and Procedure Qualification Records shall in no way relieve Seller of the responsibility to provide welds which are sound and suited to the services for which they are intended.

2.2.1.2 Welding and nondestructive test symbols shall be in accordance with AWS A2.4.

2.2.1.3 Welding terms and definitions shall be in accordance with AWS A3.0.

2.2.1.4 Cleanliness shall be maintained during welding. All stubs, rods, flux, slag and other foreign material shall be removed from the weld area.

2.2.1.5 Peening is not permitted.

2.2.1.6 All weld spatter, burrs, etc., shall be ground to a smooth contour.

2.2.1.7 Fabrication aids, temporary supporting lugs, etc., that are removed by gouging or cutting shall not be cut closer than 1/8 inch from the vessel or piping surface. The remaining material shall then be ground flush with the base metal. The ground area shall be inspected for possible cracks or porosity by liquid penetrant examination. Examination shall be in accordance with Paragraph 3.2.7.

2.2.1.8 Arc strikes, weld starts and stops shall be confined to the weld joint. Arc strikes found outside the weld joint that are deeper than 1/16 inch shall be welded and then ground to a smooth contour. Those less than 1/16 inch shall be ground to a smooth contour.

2.2.1.9 Nozzles, lugs, support rings and similar items shall not be located on a weld seam unless unavoidable. Buyer authorization shall be required if any attachment is to be located on weld seam.

2.2.1.10 Where double welded butt joints cannot be utilized the root pass welds shall be made with the GTAW process. Back purging gas shall be used during welding. The purge shall be maintained until at least 0.250 inch depth of weld metal has been deposited, or the weld joint is filled, whichever is less. Purging shall be in accordance with AWS D10.11.

2.2.1.11 Tack welds in open butt joints shall be feathered into surrounding material. Cracked tack welds shall be removed.

2.2.2 Welding Qualifications

2.2.2.1 Welding Procedure Specifications, Procedure Qualification Records and Welder's Performance Qualifications shall be in accordance both with the requirements of ASME Section IX and this specification section.

2.2.2.2 Welding shall not start until Welding Procedure Specifications, Procedure Qualification Records and weld repair procedure are returned to Seller from Buyer, with authorization to proceed.

2.2.2.3 Welds deposited by procedures differing from those authorized shall be rejected and completely removed at Seller's cost.

2.2.2.4 Any welder shall be retested and recertified when the work of said welder creates a reasonable doubt as to the quality of his/her workmanship.

2.2.2.5 The Seller shall qualify Welding Procedure Specification and Procedure Qualification Records for welding Inconel 690. The Seller shall use base material and filler metal in accordance with Specification Section 05010 and 05011. Qualification shall be in accordance both with ASME Section IX and this specification section.

2.2.3 Acceptable Welding Processes

2.2.3.1 Welding may be achieved by any one or combination of the following welding processes:

Welding Process	AWS Letter Designation
Shielded Metal Arc Welding	SMAW
Manual and Automatic Gas Tungsten Arc Welding	GTAW
Automatic Submerged Arc Welding	SAW

2.2.3.2 Other welding processes such as Gas Metal Arc, Manual Submerged Arc and processes employing flux-cored electrodes require specific written authorization by the Buyer. Submit all pertinent data and intended application of said process for evaluation.

2.2.3.3 SAW process shall not be used on nickel alloys.

PART 3 EXECUTION

3.1 **PREPARATION**

3.1.1 Weld joint preparation shall be made by mechanical means or thermal cutting. When thermal cutting is performed, the joint surfaces shall be ground to bright metal prior to welding. Oxy-fuel cutting of stainless steel, nickel alloy and Inconel 690 is not acceptable.

3.1.2 Permanent backup strips are not permitted without specific written authorization from the Buyer. If temporary backup rings are used and then removed, the weld area shall be dressed and examined for cracks and other defects. Examination of the weld surfaces shall be performed visually and by the liquid penetrant method. Liquid penetrant examination shall be in accordance with Paragraph 3.2.7.

3.1.3 To minimize the contamination of Type 304L stainless steel, duplex stainless steel, nickel alloy and Inconel 690 the Seller shall follow the requirements of Specification Section 13252 prior to and after welding.

3.1.4 All surfaces to be welded shall be free of paint, oil, grease, dirt, scale and other foreign materials detrimental to weld soundness.

3.1.5 Joint edges and adjacent surfaces to be welded shall be wire-brushed. They shall then be cleaned with an ethyl alcohol or acetone dampened lint-free cloth before welding begins.

3.1.6 Wire brushes shall be made of 300 series austenitic stainless steel. Clearly mark mechanical cleaning tools such as grinding wheels, files, deburring tools and wire brushes. Marking shall identify tools to be used on stainless steel and nickel alloys only.

3.1.7 Grinding shall be done in such a method that overheating of base and weld metal is minimized. Heat tint is an indication of overheating. Abrasive disks and abrasive flapper wheels are preferred over grinding disks or continuous-belt grinders.

3.1.8 For Inconel 690 and nickel alloy, an area 1 inch wide minimum on each side of a weld joint including backside of the joint shall be ground to bright metal with 80 grit abrasive disk prior to welding.

3.1.9 For Inconel 690 and nickel alloy, the design of weld joints shall take into consideration the low fluidity and low penetration characteristics inherent in nickel alloys.

3.1.10 When specific details of fabrication are not shown on the Contract Documents, fabrication shall be in accordance with the requirements of ASME B31.3.

3.1.11 When welded joints involving two different pipe wall thicknesses are to be made, a 4 to 1 taper shall be made on the inside of the thicker pipe to avoid any detrimental mechanical notches in the piping system.

3.1.12 To ensure accurate cutting and proper fit-up of piping, a template shall be used to lay out header, laterals and other irregular details.

3.2 **INSTALLATION, APPLICATION AND ERECTION**

3.2.1 All welds shall be made in accordance with Contract Documents and Seller's fabrication drawings.

3.2.2 Flux, weld spatter and any slag shall be removed from each weld bead prior to depositing each succeeding pass.

3.2.3 Welding starts and stops in welds shall be held to a minimum. Each such stop shall be properly conditioned before continuing the welding. The use of starting and stopping plates is recommended where possible.

3.2.4 Each weld shall be uniform in width and size through its full length. Welds shall be free of coarse ripples, grooves, overlap and undercut. Intermittent welds are not permitted because of increased chance of stress corrosion cracking.

3.2.5 To prevent oxidation of nickel alloy and Inconel 690 filler metal during the GTAW process, the filler metal tip shall remain in the shielding gas until the weld is complete or the tip is allowed to cool. If the tip is oxidized, the oxidized portion shall be cut off before welding is resumed.

3.2.6 Preheat and Interpass Temperature Control

3.2.6.1 For 304L stainless steel and duplex stainless steel, the minimum preheat shall be 50°F. The maximum interpass temperature shall not exceed 350°F.

3.2.6.2 For nickel alloy and Inconel 690, the minimum preheat shall be 60°F.

3.2.7 Inspection and Nondestructive Examination

3.2.7.1 General Requirement

Specific nondestructive examination (NDE) shall be as noted on Contract Documents and Form E-651. NDE methods, acceptance criteria and additional general requirements shall be in accordance with the following subparagraphs. All NDE, except visual examination, shall be performed by personnel certified in accordance with ASNT SNT-TC-1A.

3.2.7.2 Inspection

A. Seller's welding inspector shall be qualified and certified in accordance with AWS QC1 or equal authorized by Buyer.

B. All weld inspection reports shall be maintained and submitted in accordance with Paragraph 1.6.

3.2.7.3 Visual Examination (VT)

A. Visual examination shall be performed in accordance both with ASME Section V, Article 9 and this specification section.

B. The welds to be examined, the evaluation of indications and the acceptance criteria shall be in accordance with ASME Section V, Article 9, Paragraphs T-950-1 and T-950-2, and ASME Section VIII, Division 1, Paragraph UW-35.

C. For piping, the acceptance criteria shall be in accordance with ASME B31.3, Paragraphs 341.3.2.

D. Visual examination shall be performed on accessible surface of all completed welds.

E. In addition to visual examination of completed welds, visual examination is required for all ground and blended welds.

F. Groove and fillet welds shall have a uniform transition from the base material into the weld deposit. They shall be free of undercut and unfused overlap.

3.2.7.4 Liquid Penetrant Examination (PT)

A. Liquid penetrant examination (PT) procedures shall be in accordance with the requirements and methods specified in ASME Section V, Article 6.

B. Penetrant materials shall meet the requirements of Paragraph T-625 of Article 6, ASME Section V for sulfur and halogen content regardless of the type of material to be examined.

C. PT shall include a band of base metal at least 1 inch wide on each side of the weld.

D. The evaluation of indications and the acceptance criteria shall be in accordance with ASME Section VIII, Division 1, Appendix 8, Paragraphs 8.3 and 8.4 and Part UHA Paragraph UHA-34.

E. For piping, the evaluation of indications and the acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2.

3.2.7.5 Radiographic Examination (RT)

A. Radiographic examination procedures and techniques shall be in accordance with ASME Section V, Article 2.

B. The acceptance criteria and extent of examination shall be in accordance with ASME Section VIII, Division 1, Paragraph UHA-33.

C. For piping, the acceptance criteria and examination methods shall be in accordance with ASME B31.3, Paragraph 341.3.2 and 344.5.

3.2.7.6 Ultrasonic Examination (UT)

A. Ultrasonic examination procedures and techniques shall be in accordance with the requirements and methods specified in ASME Section V, Article 5.

B. The acceptance criteria shall be in accordance with ASME Section VIII, Division 1.

3.2.8 Charpy Impact Testing

3.2.8.1 Procedure Qualification Record (PQR)

A. Testing is only required when welding duplex stainless steel remote connector nozzles to stainless steel piping.

B. Deposited weld metal and both heat affected zones shall be tested with results recorded on the PQR.

C. Testing shall be in accordance with ASME Section VIII, Paragraph UG-84.

D. The minimum impact energy shall be 18 ft.-lbs. at room temperature.

3.3 **FIELD QUALITY CONTROL**

(Not Used)

3.4 **ADJUSTMENTS**

3.4.1 Weld Repairs

3.4.1.1 All weld repairs shall be performed in accordance with the approved weld repair procedure.

3.4.1.2 Unacceptable indications shall be completely removed by chipping, gouging, grinding or other authorized methods (for the type of material being repaired) to clean, sound metal. The excavated areas shall be examined by the liquid penetrant method to assure complete removal of defects. Liquid penetrant examination shall be in accordance with Paragraph 3.2.7.

3.4.1.3 The repaired areas shall be reexamined using the same inspection procedures by which the defect was originally detected, along with all other inspection called out for the particular weld.

3.4.1.4 Two repair attempts will be allowed on any one defective area. No further repair attempts shall be carried out without the authorization of Buyer.

3.5 **CLEANING**

(Not Used)

3.6 **PROTECTION**

(Not Used)

3.7 **DEMONSTRATION**

(Not Used)

3.8 **SCHEDULES**

(Not Used)

END OF SECTION

ATTACHMENT A

WELD MAP DATA SHEET

Buyer P.O. No. Item No.

Buyer Weld Specification No.

1. Draw a single line sketch of the pressure-retaining parts.
2. Identify each qualified welding procedure.

SKETCH

Seller Address Buyer PO#

This Form Completed By _____

Telephone No. _____

Revisions _____

Date _____

Buyer Welding Eng. Review Block

ATTACHMENT B
WELDING PROCEDURE SUMMARY DATA

Space No.	Action to be Taken
1	Enter the Buyer's Purchase Order number. A separate summary must be completed for each P.O. and suborder.
2	Enter the Buyer's item number(s). The summary sheet must reflect all items of similar construction that will have common welding procedures. Items of markedly different materials or methods of manufacture should be entered on separate WPS's.
3	Enter Seller's name.
4	Enter Seller's shop location where work will be performed.
5	Enter date summary is compiled.
6	Enter Buyer serial number and revision (Buyer's use only).
7	Enter Welding Procedure Specification (WPS) number.
8	Enter Procedure Qualification Record (PQR) number(s) supporting the WPS.
9	Enter the welding process(es) used in performing (PQR).
10	Enter type of joint as referenced in Legend. Where (E) is used, state type of joint or overlay in space 17.
11	Enter ASME-ASTM materials to be used in fabrication.
12	Enter base metal thickness range qualified by PQR.
13	Enter post weld heat treatment information in appropriate box.
14	Enter other pertinent information in this space. Such as impacts, etc.
15	Enter current review status of weld procedure (Buyer's use only).
16	Enter date of current review status of weld procedure (Buyer's use only).
17	Enter any special design or process information regarding the item of construction in this box.

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

ATTACHMENT B

WELDING PROCEDURE SUMMARY

Welding Pressure Vessels

SERIAL NO.	PROCEDURE NO.	SUPPORTING PQR	PROCESS	JOINT TYPE	ASME-ASTM MATERIAL	THICKNESS QUALIFIED	PHWT		COMMENTS	STATUS	DATE
							YES	NO			
6	7	8	9	10	11	12	13		14	15	16

LEGEND

JOINT TYPE DESCRIPTION

- A Longitudinal Seam
- B Circumferential Seam
- C Pipe Seam
- D Nozzle Seam
- E Other (Explain in comments section)

REVIEW TYPE

- A Commence Fabrication
- B Commence Fabrication Submit w/Corrections
- C Do Not Fabricate

REMARKS:

17

SELLER: 3

P.O. NO.: 1 ITEM(S):

SHOP LOCATION: 4 DATE: 5

2

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Advanced Technology Division
Fluor Contract 8457

Rev. 0

ATTACHMENT B

WELDING PROCEDURE SUMMARY

Welding Pressure Vessels

SERIAL NO.	PROCEDURE NO.	SUPPORTING PQR	PROCESS	JOINT TYPE	ASME-ASTM MATERIAL	THICKNESS QUALIFIED	PHWT		COMMENTS	STATUS	DATE
							YES	NO			

LEGEND

JOINT TYPE DESCRIPTION

- A Longitudinal Seam
- B Circumferential Seam
- C Pipe Seam
- D Nozzle Seam
- E Other (Explain in comments section)

REVIEW TYPE

- A Commence Fabrication
- B Commence Fabrication Submit w/Corrections
- C Do Not Fabricate

REMARKS:

SELLER: _____ SHOP LOCATION: _____ DATE: _____

P.O. NO.: _____ ITEM(S): _____

ATTACHMENT C

FORM E-651

GENERAL REQUIREMENTS

SUMMARY OF HEAT TREATMENT, NDE AND RELATED REQUIREMENTS FOR WELDED PIPING

1a. For stainless steel: Preheat base metal to 50°F for all thicknesses. Maximum interpass temperature shall not exceed 350°F

2a. 100% radiographic examination (RT) of buttwelds shall be performed in accordance both with this specification section and ASME B31.3, Paragraphs 341.3.2 and 344.5, for Normal Fluid Service.

3a. 100% visual examination (VT) of piping shall be performed in accordance both with this specification section and ASME B31.3, Paragraph 341.4.1, for Normal Fluid Service.

Client: DEPARTMENT OF ENERGY
Plant: HANFORD WASTE VITRIFICATION PLANT
Location: RICHLAND, WASHINGTON

SUMMARY OF HEAT TREATMENT, NDE AND RELATED REQUIREMENTS FOR WELDED PIPING
FLUOR DANIEL E-651 FORM

Contract: 845734
Welding Engineer: A. ESTRADA
Rev. 0

REVISION	LINE CLASS	CATEGORY* D or M	Pipe Material And P-Number	Non-Pressure Attachment Material And P-Number	HEAT TREATMENT				DESTRUCTIVE AND NON-DESTRUCTIVE EXAMINATION							NOTES	WELDING PROCEDURE SPECIFICATION(S)
					BUTT AND FILLET WELDS	SOCKET AND SEAL WELDS	NON PRESSURE ATTACHMENTS	BENDS	RADIOGRAPHY (RT)	ULTRASONIC (UT)	MAGNETIC PARTICLE (MT)	LIQUID PENETRANT (PT)	CHARPY IMPACT	BRINELL HARDNESS (BHN)	VISUAL (VT)	Numbers appearing below are applicable note numbers. See previous pages for explanation of notes for destructive and non-destructive examination and postweld heat treatment.	
	A		304L SS P-8	304L SS P-8	1a	1a	1a		100%,2a	–	–	–	–	–	100%,3a	ASME B31.3	

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 13250
FABRICATION OF MELTER AND FRAME ASSEMBLY
B-595-P-P06A-13250

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3 X 4__

ORIGINATOR:

A Russell 12/18/92
A. Russell, Mechanical Engineer Date

CHECKER:

D. A. Buzzelli 12-18-92
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

C. J. Divona 12-18-92
C. J. Divona Lead Discipline Engineer Date

SECTION 13250
FABRICATION OF MELTER AND FRAME ASSEMBLY
B-595-P-P06A-13250

TABLE OF CONTENTS

ATTACHMENTS

SECTION 13250
FABRICATION OF MELTER AND FRAME ASSEMBLY

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the general requirements for fabrication, assembly, test and delivery of major elements of a glass melter to vitrify radioactive liquid waste for the Hanford Waste Vitrification Project (HWVP). This specification section does not include additional melter components which will be installed and connected at the HWVP site.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B46.1	1985 Surface Texture, Surface Roughness, Waviness and Lay

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A480/A480M	1991 General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip
ASTM A269	1990 Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A240	1991 Standard Specification for Heat Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Codes

ASME Section II, Part A	1989 Material Specifications - Ferrous Materials
SA-312/SA-312M	1989 Specification for Seamless and Welded Austenitic Stainless Steel Pipe

SA-358/SA-358M	1989 Specification for Electric-Fusion-Welded Austenitic Chromium-Nickel Alloy Steel for High-Temperature Service
SA-403/SA-403M	1989 Specification for Wrought Austenitic Stainless Steel Piping Fittings
ASME Section VIII, Division 1	1989 Rules for Construction of Pressure Vessels

PIPE FABRICATION INSTITUTE (PFI)

PFI ES-24	1990 Pipe Bending Methods, Tolerances, Process and Material Requirements

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-10	1989 Surface Preparation Specification No. 10 Near White Blast Cleaning

1.3 **RELATED REQUIREMENTS**

Specification Section 05060	Welding Structural
Specification Section 05063	Welding Pressure Vessels
Specification Section 13251	Fabrication and Installation of Melter Refractory and Insulation
Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys
Specification Section 13253	Fabrication of Melter Bus Bars
Specification Section 13254W	Fabrication and Installation of Monofrax K3 Refractory
Specification Section 14400	Melter Frame Lifting Yoke Fabrication
Specification Section 16120	Soldering - Electrical
Specification Section 16610	Electrical Requirements for Packaged Equipment
Specification Section 17915	Thermocouple Furnished with Melter

MELTER/FRAME FABRICATION AND ASSEMBLY DRAWINGS

Drawings as Listed in Attachment A.

RELATED DRAWINGS

Drawings as listed in Attachment B.

1.4 **DEFINITIONS**

CMTR - Certified Material Test Report

NDE - Nondestructive Examination

1.5 **SYSTEM DESCRIPTION**

The HWVP is designed to immobilize high-level radioactive waste by converting it into a stable borosilicate glass form. This conversion process takes place in the glass melter. This is a refractory-lined, water-cooled, unstamped ASME Section VIII vessel designed for a production rate of 220 pounds of glass per hour.

Energy for the glass melt is provided by passing electric current between two pairs of plate electrodes immersed in the glass. The resistance of the glass to current flow generates heat by the joule effect. Additional heat energy is furnished by eight dome heaters located above the melt pool. Molten glass is poured via differential pressure from the melter pour spout into stainless steel canisters.

The feed material consists of a slurry composed of approximately 13 percent waste material, 37 percent glass frit and 50 percent water. This is metered at a gallon per minute through two feed tubes to the glass melt. The feed is continuous during the canister fill cycle. After a canister is filled, glass pouring is stopped while a new empty canister is rotated into position by a turntable.

All top head-mounted instruments are designed to be removed and replaced by a remotely-operated impact wrench and overhead crane. Required process fluids and electrical power are supplied by jumpers that connect each component to the wall nozzles in the melt cell.

The melter vessel is assembled into a large frame that provides lifting lugs for installation and connectors for the process and electrical jumpers. The vessel is hard-piped to the frame and becomes a permanent part of it.

The Melter Vessel Assembly is replaced periodically. Therefore the Melter Vessel Assembly is designed to be remotely removable and replaceable. Prior to removal it is intended to empty the glass through a drain valve at the bottom.

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Shop detail and fabrication drawings based on the Contract Drawings shall be submitted for Buyer approval. These drawings shall show:

A. Weld symbols and Nondestructive Examination (NDE) symbols.

B. Member sizes, dimensions and tolerances, threaded fasteners, dowel pins, studs, etc. necessary for fabrication if not already shown on the Contract Drawings.

1.6.2 In lieu of preparing the above drawings, Seller may request a copy of the Buyer's Contract Drawings on electronic media (Auto Cad - Release 10). Seller may then add the above information and any additional fabrication details.

1.6.3 Submit the following procedures for Buyer approval:

A. Cutting, forming and shaping each piece.

B. Procedures for material control and handling during fabrication in accordance with Paragraph 2.1.4.

C. Methods to reduce or control residual stresses and improve dimensional stability. These procedures shall be in accordance with Paragraph 2.2.1.2.

D. Proof load testing procedures of melter frame in accordance with Paragraph 2.6.2.3.

E. Cleaning procedures in accordance with Paragraph 2.9.

F. Helium leak testing and hydrostatic testing procedures in accordance with Paragraphs 2.4.2, 2.5.2 and 2.8.

G. NDE procedures in accordance with Paragraph 2.3.1.

H. Attachment and electrical isolation of B-type thermocouple specified in Specification Section 17915 to Inconel dam. See Drawing H-2-120052 Sheet 4 for arrangement.

1.6.4 Certified Material Test Reports (CMTRs) shall be submitted for Buyer review. These shall be in accordance with Paragraph 2.1.6.3.

1.6.5 Samples for surface finish shall be submitted for Buyer approval. These shall be in accordance with Paragraph 2.1.5.6 and 2.1.5.7.

1.6.6 Thread lubricant technical data shall be submitted for Buyer approval. This data shall be in accordance with Paragraph 2.6.3.2.

1.6.7 Procedures which define how such features as centerlines, critical contours, dimensions, flatness and parallelism will be established, measured and controlled shall be submitted for Buyer approval. At minimum, the procedures shall define the techniques to be used by Seller to perform the following:

1.6.7.1 Facility descriptions and machining equipment to be used in fabrication and assembly shall be submitted for Buyer information.

1.6.7.2 Procedures to be used by Seller during welding in order to maintain dimensional stability and to achieve tolerance requirements shall be submitted for Buyer approval.

1.6.7.3 Preheat and postweld heat treatment and/or stress-relieving procedures to be used by Seller in fabrication in accordance with Paragraph 2.2.1.2 shall be submitted for Buyer approval.

1.6.7.4 Seller-furnished methods and optical/electronic equipment to maintain and verify dimensional and tolerance control requirements shall be submitted for Buyer information.

1.6.7.5 Methods, frequency and verification of precision measurement instrument calibration shall be submitted for Buyer information.

1.6.8 Procedures for shipment to maintain dimensional and tolerance requirements, preclude damage to refractory, projecting dowel pins, threaded studs, etc., shall be submitted for Buyer approval.

1.6.9 Records and test reports such as leak testing, NDE, dimensional records, electrical continuity, equipment balancing, etc, shall be submitted for Buyer review.

1.6.10 Seller shall submit an accounting for Buyer review of all Buyer-supplied materials as to the use, fabrication and waste.

1.6.11 Procedures for final dimensional check in accordance with Paragraph 2.3.3.3 shall be submitted for Buyer approval.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A.	Site Elevation	714 feet above sea level
B.	Barometric Pressure	14.3 psia

1.8.2 Operating Environment

A.	Normal Temperature	60°F to 104°F
B.	Maximum Temperature	104°F
C.	Relative Humidity	Not controlled

1.8.3 Radiation

Equipment located outside of the vessel but inside the Melter Vessel Assembly is subject to a maximum unshielded total integrated dose of 3×10^8 Rads.

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Scope of Work

2.1.1.1 Fabrication of the following melter components in accordance with Contract Drawings listed in Attachment A of this specification section.

A. Shell
B. Head
C. Frame
D. Bus bars
E. Melter support beam
F. Melter frame lifting yoke
G. Various shipping supports and fixtures

2.1.1.2 Installation of the melter shell in the melter frame.

2.1.1.3 Installation of bus bars.

2.1.1.4 Installation of Buyer-furnished nozzles and electrical connectors.

2.1.1.5 Installation of piping, conduit and wiring.

2.1.1.6 Hydrostatic leak testing of vessel cooling passages and piping.

2.1.1.7 Preparation of pipe spool pieces for installation by others at the HWVP site.

2.1.1.8 Design and fabrication of any special equipment such as hangers, supports, fittings, etc. not shown on the Contract Drawings or melter model.

2.1.1.9 Fitup check of components shipped separately to assure proper alignment when received at the HWVP site.

2.1.1.10 Preparation for shipment to the HWVP site.

2.1.1.11 Installation of B-type thermocouple (Reference Specification Section 17915) in the Inconel dam.

2.1.1.12 Facilities for installation and dryout of refractory and insulation by others.

2.1.2 Items provided by Buyer

A. Lower electrical connector housings.

B. Insulator plates, pins, connectors and miscellaneous internals for lower electrical connector housings.

C. Process nozzles and inserts.

D. Melter head handling fixture.

2.1.2.1 Seller shall account for all Buyer-supplied items and materials. Seller shall return all unused items and materials to Buyer.

2.1.3 Types of Materials

All materials of construction are identified on the Contract Drawings listed in Attachment A. In addition:

2.1.3.1 All stainless steel plate, sheet and strip shall be ASTM A240 supplied hot rolled, annealed and pickled. Blasting as a descaling method shall not be permitted.

2.1.3.2 All stainless steel bars and shapes shall be conditioned Class A.

2.1.3.3 All stainless steel pipe shall be in accordance both with ASME SA-312/SA-312M Type 304L and ASME SA-358/SA-358M Type 304L. SA-312 pipe shall be seamless hot finished, annealed and pickled. SA-358 pipe shall be Class 1 or 3 welded, annealed, radiographed and pickled.

2.1.3.4 All fittings shall be in accordance with ASME SA-403/SA-403M Grade 304L. Fittings shall either be Class WP-S or WP-WX.

2.1.3.5 All mechanical tubing shall be supplied in the welded, annealed and pickled condition and shall be in accordance with ASTM A269.

2.1.3.6 ASTM material specifications may be used in place of ASME Section II, Part A material specifications when allowed by the ASME Boiler and Pressure Vessel Code.

2.1.4 Contamination of Materials

2.1.4.1 There shall be minimal contamination of the stainless steel or nickel-based alloys with carbon steels. Contact with clean carbon steel racks, bed plates, cutting tables, boring mills, etc., is permitted, but only when a complete inspection of the contact surfaces is done prior to any material laydown. Any of the above carbon steel surfaces shall be brushed and wiped clean of loose scale, rust or steel particles that could become embedded in the stainless steels or nickel alloys. Wood supports are preferred to minimize risk of damage to the melter vessel plates during placing and removal.

2.1.4.2 Specification Section 13252 provides requirements for materials used in contact with austenitic stainless steel and non-ferrous metals. This specification applies to all materials (e.g., carbon steel, lubricants, coolants, NDE materials, cleaners, hydrotest water, packing materials, etc.) which come in contact with the Melter Vessel Assembly and/or its components. These requirements shall be implemented by Seller.

2.1.4.3 Direct surface contact under pressure of carbon steel against stainless steel or nickel-based alloys, such as when forming, shall not be permitted during fabrication. A durable separation layer that maintains its surface integrity during the pressure/forming operation shall be provided. This requirement may, at Buyer's discretion, be waived if the area of pressure contact with carbon steel is subsequently removed by machining.

2.1.4.4 Upon completion of fabrication, examination and tests of metal surfaces shall be in accordance with the requirements of Specification Section 13252. Seller's Material Control Procedures shall describe the actions to be taken in the event of material contamination. They shall also address the cleaning and protection of materials as required.

2.1.5 Surface Finish

2.1.5.1 At the end of each Melter Vessel Assembly's service life the equipment will be decommissioned, decontaminated and eventually interred in a suitable disposal facility. In order to permit maximum decontamination, the material surface finishes described below shall be required for all Melter Vessel Assembly material.

2.1.5.2 Unless otherwise specified on design drawings, surface finish for various material forms shall be as follows: Plates shall be finished in accordance with ASTM A480/A480M Section 10, Paragraph 10.1.2, hot-rolled, annealed and pickled No. 1 finish. A shot or grit-blasted surface is not acceptable. Sheets shall be finished in accordance with ASTM A480/A480M Section 8, Paragraph 8.1.1, No. 2D finish. Strips shall be finished in accordance with ASTM A480/A480M Section 9, Paragraph 9.1.1, No. 1 finish.

2.1.5.3 Unless otherwise specified on design drawings, machined surfaces shall have a 125 finish or better in accordance with ANSI B46.1.

2.1.5.4 Nicks, gouges or other surface defects shall not be permitted. Defects greater than 1/16 inch in depth shall be repaired by welding and grinding to restore original surface contour. Defects of lesser depth shall be removed by grinding or polishing. 125 grit or finer abrasive wheels shall be used for grinding. No defects or grinding marks deeper than those left by a 125 grit abrasive wheel are permitted.

2.1.5.5 All welds shall be continuous throughout the entire length. No skip welds shall be permitted. Welds shall be smooth and blended into the base metal.

2.1.5.6 To ensure that a mutually agreeable interpretation of surface finish requirements is established prior to start of fabrication, samples of stainless steel material and weldments (for each material type and for each weld type) shall be submitted for Buyer approval. Upon Buyer acceptance these samples will be used by Buyer's Representative as comparators to determine acceptable finish quality in the supplied equipment.

2.1.5.7 Abrasive blasting as a means of descaling new material shall not be permitted. Blasting using glass beads may be acceptable for the removal of scale resulting from heat treatment of assembled components which cannot practically be pickled. A sample of the surface finish which results from the Seller's intended procedure shall be submitted for Buyer review prior to blasting on assembly components.

2.1.5.8 Surface finish of other items not specifically addressed herein shall be similar to that described above.

2.1.6 Material Control

2.1.6.1 All material shall be clearly segregated, protected, controlled, marked and stored. All stainless steel and nickel-based alloy materials shall be identified with a heat number prior to and during fabrication. Material withdrawal and use shall be made only against approved material control procedures. No unauthorized persons shall have access to materials. There shall

be no possibility of mixing materials. Materials for other jobs shall not be stored in the same area.

2.1.6.2 Seller shall identify all materials (plate, forging, pipe, bolting, etc.) by ASME/ASTM designation, ASME/ASTM alloy designation, respective ASME/ASTM class and UNS NUMBER (unified numbering system). The mill ASME or ASTM ink marking should remain to the extent possible on the fabricated components. Identifying marks made by die stamping using low-stress metal stamps is acceptable. They shall be placed on the material side that will not be exposed to process fluid after the vessel is placed in service. No stamping is permitted on the process side. Vibrotool markings shall not be permitted except for workmanship samples.

2.1.6.3 One (1) copy of CMTRs shall be provided for all material.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 General Requirements

2.2.1.1 Since the melter contains highly-radioactive materials, equipment in the Melter Cell will be installed and removed remotely using an overhead crane and impact wrench. This includes the Melter Vessel Assembly, all auxiliary equipment mounted on the melter top head nozzles and the service connections (jumpers). Each auxiliary assembly on the top head as well as its respective jumper must be interchangeable with spare equipment and with spare melter vessel assemblies. This requires that all mounting surfaces be precisely located in three planes.

To ensure interchangeability of subsequent assemblies the close tolerance requirements shown in Contract Drawings shall be strictly adhered to. Seller must conduct all close tolerance work with respect to established datum references. Work in the Seller's shop shall be performed under controlled temperature conditions as deemed necessary in order to achieve and maintain specified dimensions and tolerances.

2.2.1.2 Seller may elect to use braces, forms or similar means to preserve the vessel shape during fabrication. Seller shall perform stress relief operations to reduce residual stresses and improve dimensional stability. Detailed descriptions of the stress relief procedures shall be submitted for Buyer approval.

2.2.1.3 To minimize potential stack-up of tolerances Buyer recommends that the final elevation of nozzle flange faces on the top head be machined with the vessel installed on the lower support frame and the head installed and torqued in accordance with Drawing H-2-120237, Sheet 4. This requires Seller to assemble the vessel to the lower frame as well as allow excess flange face material to

be removed during this operation. Note that nozzle elevations are specified with respect to the datum plane established by the support pads on the bottom of the lower frame. Metal O-ring used for this operation cannot be reused. A new O-ring shall be supplied for plant use.

2.2.1.4 Seller shall maintain cleanliness standards in and around the melter during fabrication. Nozzles, etc., shall be kept covered as required to prevent ingress of any dirt, water, cuttings or similar substances. Particular care shall be taken to prevent the refractory from becoming wet or damaged.

2.2.1.5 Fabrication of all components and assemblies shall minimize pockets, absorbent materials or similar voids where contaminants can be trapped. All pockets and voids shall be seal-welded, to the extent possible.

2.2.2 Welding

2.2.2.1 All stainless steel welding and repairs shall be in accordance with Specification Sections 05060 and 05063.

2.3 **INSPECTION**

2.3.1 Nondestructive Examination (NDE)

Seller shall perform NDE of welds in accordance with Seller's written procedures for radiographic examination, ultrasonic examination or liquid penetrant examination. NDE shall also be in accordance with Specification Sections 05060 and 05063.

2.3.1.1 Radiographic Examination (RT)

All full penetration welds shall be inspected over their entire length by radiographic examination. Radiographic examination shall be performed after stress relief (if any).

2.3.1.2 Ultrasonic Examination (UT)

Welds which cannot be inspected by radiographic examination because of geometry or configuration shall be inspected by ultrasonic examination. Ultrasonic examination shall be performed after stress relief (if any).

2.3.1.3 Liquid Penetrant Examination (PT)

PT shall be performed on each weld layer of any and all welds not examined radiographically or ultrasonically.

PT, when performed:

A. Shall include areas where temporary attachments are made to parent metal.

B. Shall include all machined welds after final machining. This may take the place of the cover pass PT.

C. Shall include intermediate inspection of thick sections (such as the riser boss or bottom ring forging on the melter shell).

D. Shall be performed after stress relief (if any).

E. Shall be repeated on the melter frame lifting lugs after load testing as described in Paragraph 2.6.2.

2.3.2 Facilities for Dimensional Measurement

Seller shall provide a measurement area that includes:

A. A surface with areas of support for the melter support frame level within ±.0025 inch.

B. 30 feet of head room to the bottom of the crane hook.

C. Enclosures or partitions.

D. Temperature controlled at 68°F ±5°F during measurement for Dimensional Record Drawings. Seller shall furnish thermometers and temperature recorders with 7-day recording capability.

E. Clear space of at least 7 feet surrounding the melter vessel assembly.

F. Rigid supports for optical transits and tables. These shall be set up perpendicular to the melter centerlines, shall not be less than 7 feet away from the frame and not less than 3 feet higher than the frame.

G. Platforms, ladders, stairs and handrails.

H. Lighting suitable for optical measurements. There shall be an average of 100 footcandles in the area where measurements will be made.

2.3.3 Measurements by Seller

2.3.3.1 Seller shall measure critical dimensions of the melter, frame nozzles and head after fabrication and assembly are complete. Measurements shall be made with the head and metal O-ring bolted to the melter vessel and with the vessel installed in the frame.

The "as-built" dimension shall be recorded on the "Dimensional Record Drawings" listed in Attachment A.

2.3.3.2 Seller shall use calibrated precision measuring devices and techniques. Optical alignment and measuring devices shall be used. At minimum, these shall include jig transits and levels with optical micrometers and precision alignment scales.

2.3.3.3 Seller shall submit detailed final dimensional check procedures for Buyer approval. These shall include:

A. Methods of measurement applicable to specific components or assemblies.

B. Type of measuring device used.

C. Methods, frequency and verification of calibration for the precision measurement devices.

2.3.4 Measurements by Buyer

Buyer shall be notified 10 days in advance by Seller prior to dimensional measurement. Buyer reserves the right to attend and witness Seller's final dimensional measurements.

2.4 **MELTER HEAD**

2.4.1 Fabrication

Design details of the top head are shown in the drawings listed in Attachment A, "Melter/Frame Fabrication and Assembly Drawings."

2.4.2 Leak Testing

2.4.2.1 The vessel shell, bottom head and top head have two independent water passages each. These are identified "A" and "B" on the vessel drawings. Each passage is fed by an independent manifold. This redundancy reduces the risk of loss of the vessel through coolant failure. To ensure the integrity of this dual path system the "A" and "B" passages shall be separately tested for not less than 10 minutes.

2.4.2.2 Each manifold surrounding nozzles "A" and "T" shall be helium leak tested to 10^{-6} std cc/sec prior to installation on the top head.

A helium leak testing procedure for these nozzles and for the "A" and "B" cooling passages of the top head and shell shall be prepared by Seller and submitted for Buyer approval.

2.4.2.3 The "B" manifolds and flow channels shall be welded to the head after it and the nozzles are fabricated. The manifolds and flow channels shall then be helium leak-tested. This test shall be followed by a hydrostatic test. Water meeting the requirements of Specification Section 13252 shall be used for testing. The test pressure shall be 90 psig.

2.4.2.4 The "A" manifolds and flow channels shall be welded to the head after the tests in Paragraph 2.4.2.3 are completed. Paragraph 2.4.2.3 tests shall be repeated on the "A" manifolds and flow channels. This sequence is necessary because the "B" channel is partially covered over by the "A" channel.

2.4.2.5 Dry the flow passages in accordance with Specification Section 13252. Seal all relevant pipe openings with plastic caps.

2.4.3 Head Handling Fixture

Buyer will provide a Head Handling Fixture. This fixture will be capable of carrying the completed top head in either upright or inverted orientation. It will also be capable of rotating the head between these two positions. Seller shall install the head into this fixture after head fabrication is complete. This shall be done prior to refractory installation.

Subsequent epoxy coating and refractory installation shall be done with the head in the inverted orientation. The head shall remain in the inverted position in the handling fixture for shipping to the Buyer.

2.5 **MELTER SHELL, BOTTOM HEAD AND RISER**

2.5.1 Design details of the melter shell, bottom head and riser section are listed in Attachment A.

2.5.2 Leak Testing of Shell and Riser

2.5.2.1 The "B" manifolds and flow channels shall be welded to the shell after the shell and nozzles are fabricated. The manifolds and flow channels shall then be helium leak-tested. This test shall be followed by a hydrostatic test. Water meeting the requirements of Specification Section 13252 shall be used for testing. The test pressure shall be 90 psig.

2.5.2.2 The "A" manifolds and flow channels shall be welded to the shell after the tests in Paragraph 2.5.2.1 are completed. Paragraph 2.5.2.1 tests shall be repeated on the "A" manifolds and flow channels.

2.5.2.3 Dry the flow passages in accordance with Specification Section 13252. Seal all relevant pipe openings with plastic caps.

2.5.3 Leak Testing of Bottom Head

On the bottom head the "A" channel does not partially cover the "B" channel. Therefore, it is not necessary to complete "B" channel testing before completion of the "A" channel fabrication. Both channels shall be tested in accordance with Paragraph 2.5.2.1.

2.5.3.1 Dry the flow passages in accordance with Specification Section 13252. Seal all relevant pipe openings with plastic caps.

2.6 **MELTER FRAME**

2.6.1 The melter frame is constructed in 2 pieces: a lower half on which the melter is placed, and an upper half which is bolted to the lower half. It is not possible to install the electrode bus bars with the frame intact around the melter. Thus the upper half is fabricated separately and the bus bars are installed on the upper half. The upper frame is then lowered over the melter and bolted to the lower frame. Fabrication and installation of the bus bars is described in Paragraph 2.12.

2.6.2 Lifting Load Test

2.6.2.1 The frame assembly shall be tested by adding 223,000 pounds, uniformly distributed, onto the melter support ring. When added to the approximate 32,000 pound weight of the frame the total weight of 127.5 tons represents 150 percent of the combined load of the melter, frame, water, glass and melter attachments. The assembly shall be lifted off the floor not less than six inches. It shall be held in this position for not less than ten minutes. Inspections and NDE re-examination of all lug welds shall be performed to detect any permanent deformation and/or cracking after completion of the proof load test.

2.6.2.2 Lifting lug welds shall be 100 percent liquid penetrant examined after completion of the proof load test. Any crack shall be cause for rejection.

2.6.2.3 Seller shall provide a written Proof Load Test procedure for Buyer approval prior to test performance.

2.6.2.4 Seller shall provide NDE and Verification Reports for all lifting lug welds re-examined and inspected after completion of the proof load test.

2.6.3 Bolting and Lifting Lug Pin Materials

2.6.3.1 Seller shall furnish CMTRs of all high-strength stainless steel structural bolting materials and lifting lug pins for Buyer review. The final tempering temperature used and the results of

hardness tests and NDE, if any, shall be shown on the test reports. These shall be in addition to other required properties.

2.6.3.2 High strength stainless steel bolts shall not be reused after having been once tightened to the full extent. Seller shall submit thread lubricant technical data for Buyer approval.

2.6.4 Nozzle and Electrical Connector Installation

2.6.4.1 Electrical connector heads and process nozzles will be provided by Buyer. When received, Seller shall modify the connectors and nozzles and mount them on the frame as shown on the Contract Drawings.

2.6.4.2 Connectors and nozzles shall be mounted and dimensioned in accordance with the Contract Drawings. The half-inch nozzle hold-down nuts shall be tightened to only 50 percent of their final torque value to allow for possible nozzle adjustments at the HWVP site. In addition, epoxy grout will not be added until final assembly at the HWVP site in case adjustments are necessary.

2.6.5 Studs and Alignment Dowels

Steel alignment dowels and studs shall be fabricated in accordance with Contract Drawings.

2.7 **MELTER FRAME LIFTING YOKE AND LUGS**

2.7.1 Design details of the melter frame lifting yoke are listed both in Attachment A and Specification Section 14400.

2.7.2 The lifting yoke is intended to lift the melter assembly in its entirety. This consists of the upper frame, lower frame, melter vessel (including refractory, insulation, glass and water) and various melter attachments. The total combined weight of the melter assembly at loadout will be approximately 85 tons.

After the 4 lifting lugs have been installed on the upper frame, the lifting yoke shall be used for subsequent handling operations.

2.7.3 Seller shall determine the location of the lifting yoke lug by calculation for the canyon crane. Seller shall base the lifting yoke lug location on the following requirement:

A. The combined Melter Vessel Assembly as described in Paragraph 2.7.2. shall hang within 2° of level when supported from the canyon crane by the lifting yoke lug.

B. The actual weight of the frame, shell, head, refractory, insulation, piping, conduit, lifting yoke and other components for which Seller is responsible. Determination of weights and moments shall be the Seller's responsibility.

C. Weights and locations of attachments which will be added to the Melter Vessel Assembly at a later time will be provided by Buyer.

2.7.4 After the lifting yoke has been fabricated and the lifting lug attached in accordance with Paragraph 2.7.3, the lifting yoke shall be counterweighted. Seller shall base the location of the lifting yoke counterweight on the following requirement:

The lifting yoke shall hang within 2° of level when supported from the canyon crane by the lifting yoke lug.

2.8 **VESSEL HYDROSTATIC TESTING**

After all welding and final machining is completed a hydrostatic test shall be performed as follows:

A. Install the head to the shell using a new stainless steel O-ring.

B. Install blind flanges and C-rings on the A and T nozzles. Refer to Drawing H-2-120052 Sheet 1 for flange and gasket details.

C. Install riser end cap, flange, pour spout adapter and rubber gaskets.

D. Install blind flanges and rubber gaskets on the riser and pour spout heater openings.

E. Install blind flanges and rubber gaskets on all other nozzles.

F. Perform vessel hydrostatic testing at 18 psig. Maintain pressure for not less than 10 minutes.

G. Remove the top head.

H. Drain and dry the shell and head. Swab all residual water from both components.

Water used for hydrostatic testing and drying shall be in accordance with the requirements of Specification Section 13252.

2.9 **CLEANING**

Interior and exterior surfaces shall be thoroughly cleaned of all mill scale, cuttings, weld spatter, grease, oil and other foreign matter. A cleaning procedure shall be submitted for Buyer approval. Stainless steel equipment shall not be painted.

2.10 **EPOXY COATING**

After leak testing and cleaning, the inside surfaces of the head (including nozzles), shell, bottom head and riser barrel shall be coated with an epoxy coating in accordance with Attachment C.

2.11 **REFRACTORY**

2.11.1 Installation

The melter head, shell and riser shall be lined with refractory and insulation after fabrication and hydrostatic testing are complete. Refractory shall be installed by a refractory contractor in accordance both with Specification Section 13251 and Specification Section 13254W at Seller's shop.

2.11.2 Assembly and Storage Area

Seller shall provide free access to the vessel for the refractory contractor's personnel.

Seller shall furnish support facilities for the refractory contractor's use. Requirements are as follows:

A. Sufficient indoor, clean, dry storage area for refractory materials (approximately 2000 sq. ft.). In addition, a storage area maintained above 40°F and large enough to store approximately 20 5-gallon containers of pumpable insulation shall be provided.

B. A work area shall be provided. This work area shall provide approximately 7 feet clear on all sides of the melter vessel and lid. Temperature of the work area and melter shell shall be maintained between 60°F and 100°F during refractory installation.

C. Electrical service, both 110 volt single-phase and 440 volt 3-phase in the near area.

D. Compressed air in the near area.

E. Unloading dock with a truck-high dock to receive and ship the refractory contractor's shipments as required.

F. 2000 pound capacity jib crane. The crane shall be mounted to reach all areas of vessel and lid to lift refractory pieces to a height approximately 8 feet above top of vessel.

G. Lighting is to be nominal building lighting in good operating condition.

2.11.3 After refractory dryout of the shell has been completed by the refractory contractor in accordance with Specification Section 13251, Seller shall seal the vessel to minimize moisture absorption and stabilize for shipment. Seller shall provide and install the following:

A. Steel cover and gasket on the shell main flange.

B. Dummy riser/pour spout tube.

C. Dummy riser heater and gasket.

D. Dummy pour spout heater and gasket.

E. Drain valve plug, plywood washer and nut.

F. Riser end flange assembly.

G. Pour spout lower flange and plywood cover.

2.12 **BUS BARS**

2.12.1 Seller shall fabricate the melter bus bars, electrode clamps and attachment hardware in accordance both with Specification Section 13253 and the Contract Drawings listed in Attachment A.

After fabrication, the melter bus bars shall be insulated and installed on the melter frame as described on the Contract Drawings.

2.12.2 Installation

The melter bus bars must first be attached to the upper frame assembly. The upper frame assembly shall then be lowered over the melter and bolted to the lower frame assembly.

Seller will provide and connect all hangers, insulators, and attachments to secure the bus bars to the melter frame. Seller shall supply the connector clamps and hardware as shown on the Contract Drawings.

2.13 PIPING CONNECTIONS

2.13.1 Seller shall provide stainless steel piping connections between the frame nozzles and services on the melter and between various services on the melter. At some locations, Seller will completely install and test the piping assemblies. At other locations, Seller will

A. Install only portion of the piping and provide spool pieces for final assembly by others at the HWVP site.

B. Install only portions of the piping with the balance of piping provided by others and installed at the HWVP site.

These locations are identified in Table II of Drawing H-2-120052.

2.13.2 The location, size and routing of piping is identified on a plastic model, 1-1/2 inch = 1 foot scale, of the Melter Vessel assembly. The plastic melter model demonstrates that the depicted pipe and conduit routing configuration are technically feasible. This model shall be furnished by Buyer. Seller shall use the model as a pattern for piping and conduit routings and equipment placement. Model shall be returned to Buyer in its original condition upon order completion, for use by others for fabrication and installation of remaining piping, conduit and electrical connectors.

The model will identify:

A. Piping to be assembled and installed by Seller;

B. Piping to be provided by Seller as spool pieces;

C. Piping to be provided and installed by others at HWVP site.

Spool pieces shall be weld-prepped on the end to be connected to the Seller-installed piping. Additional length shall be provided on the other end to permit trimming and weld prep in the field. Spool pieces shall be checked for fit-up on the melter/frame assembly, then shipped to the HWVP site. All components shall be labeled and packaged to permit identification in the field.

2.13.3 Seller shall provide all piping materials except for the piping provided by others referenced in Paragraph 2.13.1(B). This shall include pipe, fittings, pipe supports, flow orifices and dielectric connectors. All welding shall be in accordance with Specification Section 05063.

Nozzles on the melter frame to which the piping is welded will be provided by the Buyer as noted in Paragraph 2.6.4.1.

2.13.4 Seller shall provide a short, removable coupling as shown on Drawing H-2-120076. This coupling contains an orifice for flow balancing to be done at the HWVP site by others after all melter piping has been installed. The removable coupling with test orifices shall be removed and the permanent orifices shall be welded into the line by others after flow balance tests are completed. Specific lines to be fitted with orifices are shown in the following table:

Cooling Water Supply to	Orifice Size, Inches, +/- 1/64
Top Head (Connection F6)	55/64
Dome Heater Covers Supplied from A Path	7/16
Bottom Head (Connection F4)	15/32
Top Head (Connection F1)	49/64
Bottom Head (Connection F7)	35/64
Electrode 2 (Connection P2)	11/32
Electrode 3 (Connection P3)	3/8
Electrode 4 (Connection P4)	3/8
Dome Heater Covers Supplied from B Path	7/16

2.13.5 Seller shall provide (and install where identified on the model) all components for the dielectric connectors shown on Drawing H-2-120076, which electrically isolate piping connected to electrified components on the melter.

2.13.6 All piping installed by Seller shall be hydrotested at 90 psig for not less than 10 minutes.

Test water shall be in accordance with the requirements of Specification Section 13252.

2.13.7 90-degree elbows may be substituted for "3D" bends. Bends shall conform to PFI ES-24. Minimum wall thickness after bending shall be as follows:

Type of Bend	Minimum Thickness After Bend
3D Furnace Blend	80 percent of initial wall
3D Induction and Incremental Blend	87.7 percent of initial wall
3D Rotary Draw Blend	78 percent of initial wall
3D Ram and Roll Blend	85 percent of initial wall

2.13.8 Piping shall be within the 11 foot width and 22 foot-10 inch length of the melter frame.

2.13.9 All 1½ inch and larger piping shall be Schedule 10s. Smaller piping shall be Schedule 40.

2.14 **ELECTRICAL CONNECTIONS**

Seller shall:

2.14.1 Provide all connectors (except those on the melter frame identified in Paragraphs 2.1.2D & E), conduit, pullboxes, supports, etc. in accordance with Specification Section 16610.

2.14.2 Solder wiring to pin connectors, clean and test in accordance with Specification Section 16120. Install wiring in electrical connector housings on the melter frame.

2.14.3 Pull wiring through conduit and pull boxes as identified both on the wiring diagrams listed in Attachment A and the model. Seller shall perform either A or B below:

A. Complete the connections identified on Sheet 5 of Drawing H-2-120052.

B. Leave sufficient excess wiring extending from the conduit for final connection by others to equipment installed at the HWVP site. Wire ends shall be wrapped and protected for shipment.

2.14.4 Seal wiring extending from the conduit with heat shrink tubing and compatible potting compound to prevent intrusion of moisture or contaminants into the conduit.

2.14.5 Label all wire ends in accordance with Specification Section 16610 and as shown on Contract Drawings.

2.14.6 Install cover plates on pull boxes to provide moisture protection during shipment. Cover plates will be removed at the HWVP site for additional wiring and continuity tests.

2.14.7 Conduct electrical isolation and continuity tests in accordance with Specification Section 16610.

2.14.8 Install inconel dam and Attach B-type thermocouple in accordance with Buyer-approved procedures. Since this operation must be done during installation of insulation in the riser, Seller must coordinate with the Refractory Contractor.

2.15 **SHIPPING**

Seller shall perform all necessary packing to prepare the partially-assembled Melter Vessel Assembly, Head Handling Fixture with melter head, yoke and other items for shipment to the HWVP site.

All flanges shall be protected by wood covers bolted in place, weld ends by caps, socket connections by plastic plugs and threaded connections with plastic thread protectors. All closures shall be adequate to prevent corrosion and damage of the equipment both while in transit to the worksite and in storage while awaiting erection.

The preferred method of shipment for the melter vessel assembly is by dedicated truck. Shipment by dedicated train is permitted if local regulations prohibit truck shipment. Other shipment methods may be acceptable but shall have prior Buyer approval.

Seller shall provide detailed procedures for Buyer approval of the packaging, shipping and protection of refractory.

Estimated shipping weights are as follows:

Melter Vessel and Frame Assembly: 120,000 pounds.

- Includes refractory in vessel shell.
- Does not include melter head.

Melter Head: 50,000 pounds.

- Includes refractory and Head Handling Fixture.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

MELTER/FRAME FABRICATION AND ASSEMBLY DRAWINGS

DRAWING NO.	SHT	OF	TITLE		
MELTER/FRAME ASSEMBLY					
H-2-120052	1	5	ME-130-001	MELTER VESSEL/FRAME ASSEMBLY	PARTS LIST AND NOTES
H-2-120052	2	5	ME-130-001	MELTER VESSEL/FRAME ASSEMBLY	MELTER AND FRAME ASSEMBLY
H-2-120052	3	5	ME-130-001	MELTER VESSEL/FRAME ASSEMBLY	MELTER ASSEMBLY AND CONNECTION LOCATIONS
H-2-120052	4	5	ME-130-001	MELTER VESSEL/FRAME ASSEMBLY	SECTIONS
H-2-120052	5	5	ME-130-001	MELTER VESSEL/FRAME ASSEMBLY	TABLES AND NOTES
H-2-120076	1	1	ME-130-001	MELTER VESSEL/FRAME ASSEMBLY	MISC. PIPING DETAILS
H-2-127459	1	2	ME-130-001	MELTER VESSEL/FRAME ASSEMBLY	PIPING ISOMETRIC
H-2-127459	2	2	ME-130-001	MELTER VESSEL/FRAME ASSEMBLY	PIPING ISOMETRIC
TOP HEAD					
H-2-120235	1	12	ME-130-001	MELTER TOP HEAD	PARTS LIST AND NOTES
H-2-120235	2	12	ME-130-001	MELTER TOP HEAD	ASSEMBLY
H-2-120235	3	12	ME-130-001	MELTER TOP HEAD	COOLING JACKET
H-2-120235	4	12	ME-130-001	MELTER TOP HEAD	LIFTING LUGS
H-2-120235	5	12	ME-130-001	MELTER TOP HEAD	NOZZLES - E, G1, G6, G10
H-2-120235	6	12	ME-130-001	MELTER TOP HEAD	NOZZLES - F1, F6, G18
H-2-120235	7	12	ME-130-001	MELTER TOP HEAD	NOZZLES - PLAN VIEW
H-2-120235	8	12	ME-130-001	MELTER TOP HEAD	NOZZLES - SECTIONS
H-2-120235	9	12	ME-130-001	MELTER TOP HEAD	NOZZLE A - DETAILS
H-2-120235	10	12	ME-130-001	MELTER TOP HEAD	NOZZLE T - DETAILS
H-2-120235	11	12	ME-130-001	MELTER TOP HEAD	FEED TUBE SUPPORTS
H-2-120235	12	12	ME-130-001	MELTER TOP HEAD	FEED TUBE SUPPORT DETAILS
SHELL					
H-2-120236	1	23	ME-130-001	MELTER SHELL	PARTS LIST AND NOTES
H-2-120236	2	23	ME-130-001	MELTER SHELL	PLAN VIEW
H-2-120236	3	23	ME-130-001	MELTER SHELL	SECTIONS
H-2-120236	4	23	ME-130-001	MELTER SHELL	BOTTOM VIEW
H-2-120236	5	23	ME-130-001	MELTER SHELL	ELECTRODE NOZZLE SECTION
H-2-120236	6	23	ME-130-001	MELTER SHELL	DOME HEATER NOZZLE DETAILS
H-2-120236	7	23	ME-130-001	MELTER SHELL	DOME HEATER NOZZLE DETAILS
H-2-120236	8	23	ME-130-001	MELTER SHELL	COOLING JACKET LAYOUT
H-2-120236	9	23	ME-130-001	MELTER SHELL	COOLING JACKET SECTIONS

ATTACHMENT A

DRAWING NO.	SHT	OF	TITLE		
MELTER/FRAME ASSEMBLY					
H-2-120236	10	23	ME-130-001	MELTER SHELL	COOLING JACKET
H-2-120236	11	23	ME-130-001	MELTER SHELL	JACKET MANIFOLD OUTLETS
H-2-120236	12	23	ME-130-001	MELTER SHELL	RISER SECTION
H-2-120236	13	23	ME-130-001	MELTER SHELL	POUR SPOUT JACKET
H-2-120236	14	23	ME-130-001	MELTER SHELL	RISER END
H-2-120236	15	23	ME-130-001	MELTER SHELL	RISER END SECTIONS
H-2-120236	16	23	ME-130-001	MELTER SHELL	RISER PAD DETAILS
H-2-120236	17	23	ME-130-001	MELTER SHELL	RISER JACKET
H-2-120236	18	23	ME-130-001	MELTER SHELL	RISER DETAILS
H-2-120236	19	23	ME-130-001	MELTER SHELL	RISER JACKET PIPING
H-2-120236	20	23	ME-130-001	MELTER SHELL	RISER MANIFOLD
H-2-120236	21	23	ME-130-001	MELTER SHELL	BOTTOM JACKET MANIFOLD
H-2-120236	22	23	ME-130-001	MELTER SHELL	NOZZLE N SECTIONS
H-2-120236	23	23	ME-130-001	MELTER SHELL	DRAIN VALVE SUPPORTS
H-2-120086	1	10	ME-130-001	POUR SPOUT HEATER SUPPORT	ASSEMBLY AND PARTS LIST
H-2-120086	2	10	ME-130-001	POUR SPOUT HEATER SUPPORT	CARRIAGE ALIGN. BRACKET
H-2-120086	3	10	ME-130-001	POUR SPOUT HEATER SUPPORT	ACTIVE RAIL BRACKET
H-2-120086	4	10	ME-130-001	POUR SPOUT HEATER SUPPORT	PASSIVE RAIL BRACKET
H-2-120086	5	10	ME-130-001	POUR SPOUT HEATER SUPPORT	PASSIVE RAIL KEY GUIDE
H-2-120086	6	10	ME-130-001	POUR SPOUT HEATER SUPPORT	ACTIVE RAIL KEY GUIDE
H-2-120086	7	10	ME-130-001	POUR SPOUT HEATER SUPPORT	DETAILS AND SECTION
H-2-120086	8	10	ME-130-001	POUR SPOUT HEATER SUPPORT	PASSIVE RAIL ASSEMBLY
H-2-120086	9	10	ME-130-001	POUR SPOUT HEATER SUPPORT	ACTIVE RAIL ASSEMBLY
H-2-120086	10	10	ME-130-001	POUR SPOUT HEATER SUPPORT	MODIFIED GEAR BOX
H-2-120075	1	1	ME-130-001	MELTER SHELL	INCONEL DAM
H-2-120249	1	5	ME-130-001	MELTER	ARGON FEEDING TUBE
H-2-120249	2	5	ME-130-001	MELTER	ARGON FEEDING TUBE
H-2-120249	3	5	ME-130-001	MELTER	ARGON FEEDING TUBE
H-2-120249	4	5	ME-130-001	MELTER	ARGON FEEDING TUBE
H-2-120249	5	5	ME-130-001	MELTER	ARGON FEEDING TUBE
H-2-120194	1	3	ME-130-001	MELTER SHELL	POUR SPOUT ADAPTER
H-2-120194	2	3	ME-130-001	MELTER SHELL	POUR SPOUT ADAPTER
H-2-120194	3	3	ME-130-001	MELTER SHELL	POUR SPOUT ADAPTER

ATTACHMENT A

DRAWING NO.	SHT	OF	TITLE		
MELTER/FRAME ASSEMBLY					
FRAME					
H-2-120153	1	9	MY-130-004	MELTER FRAME	PARTS LIST AND NOTES
H-2-120153	2	9	MY-130-004	MELTER FRAME	NOZZLE INSTALLATION
H-2-120153	3	9	MY-130-004	MELTER FRAME	ASSEMBLY AND DETAILS
H-2-120153	4	9	MY-130-004	MELTER FRAME	HOLE LOCATION DETAILS
H-2-120153	5	9	MY-130-004	MELTER FRAME	SECTIONS AND DETAILS
H-2-120153	6	9	MY-130-004	MELTER FRAME	SECTIONS AND VIEWS
H-2-120153	7	9	MY-130-004	MELTER FRAME	SECTIONS AND DETAILS
H-2-120153	8	9	MY-130-004	MELTER FRAME	SECTIONS AND DETAILS
H-2-120153	9	9	MY-130-004	MELTER FRAME	NOZZLE DETAILS
BUS BARS					
H-2-120238	1	4	BB-130-003,4,5,6	MELTER BUS BARS	PARTS LIST AND NOTES
H-2-120238	2	4	BB-130-003,4,5,6	MELTER BUS BARS	ELECTRODES L2 AND L4
H-2-120238	3	4	BB-130-003,4,5,6	MELTER BUS BARS	ELECTRODES L1 AND L3
H-2-120238	4	4	BB-130-003,4,5,6	MELTER BUS BARS	DETAILS
MELTER SUPPORT BEAM					
H-2-120403	1	4	MY-130-001	MELTER SUPPORT BEAM	PARTS LIST AND NOTES
H-2-120403	2	4	MY-130-001	MELTER SUPPORT BEAM	ASSEMBLY
H-2-120403	3	4	MY-130-001	MELTER SUPPORT BEAM	ASSEMBLY AND SECTIONS
H-2-120403	4	4	MY-130-001	MELTER SUPPORT BEAM	SECTIONS AND DETAILS
DIMENSIONAL RECORD DRAWINGS					
H-2-120237	1	6	MECHANICAL	MELTER VESSEL ASSEMBLY	DIMENSIONAL RECORD
H-2-120237	2	6	MECHANICAL	MELTER VESSEL ASSEMBLY	DIMENSIONAL RECORD
H-2-120237	3	6	MECHANICAL	MELTER VESSEL ASSEMBLY	DIMENSIONAL RECORD
H-2-120237	4	6	MECHANICAL	MELTER VESSEL ASSEMBLY	DIMENSIONAL RECORD
H-2-120237	5	6	MECHANICAL	MELTER VESSEL ASSEMBLY	DIMENSIONAL RECORD
H-2-120237	6	6	MECHANICAL	MELTER VESSEL ASSEMBLY	DIMENSIONAL RECORD

ATTACHMENT A

DRAWING NO	SHT	OF			
ELECTRICAL DRAWINGS					
H-2-122420	1	2	ELECTRICAL	GENERAL NOTES	AND SYMBOLS
H-2-123420	2	2	ELECTRICAL	WIRE TERMINATION	DETAILS
H-2-123421	1	1	ELECTRICAL	MELTER VESSEL ASSEMBLY	BLOCK DIAGRAMS
H-2-122422	1	11	ELECTRICAL	CONNECTION DIAGRAM	ME-130-001
H-2-122422	2	11	ELECTRICAL	CONNECTION DIAGRAM	ME-130-001
H-2-122422	3	11	ELECTRICAL	CONNECTION DIAGRAM	ME-130-001
H-2-122422	4	11	ELECTRICAL	CONNECTION DIAGRAM	ME-130-001
H-2-122422	5	11	ELECTRICAL	CONNECTION DIAGRAM	ME-130-001
H-2-122422	6	11	ELECTRICAL	CONNECTION DIAGRAM	ME-130-001
H-2-122422	7	11	ELECTRICAL	CONNECTION DIAGRAM	ME-130-001
H-2-122422	8	11	ELECTRICAL	CONNECTION DIAGRAM	ME-130-001
H-2-122422	9	11	ELECTRICAL	CONNECTION DIAGRAM	ME-130-001
H-2-122422	10	11	ELECTRICAL	CONNECTION DIAGRAM	ME-130-001
H-2-122422	11	11	ELECTRICAL	CONNECTION DIAGRAM	ME-130-001
LIFTING YOKE					
H-2-120239	1	2	HD-130-002	MELTER FRAME LIFTING YOKE	ASSEMBLY
H-2-120239	2	2	HD-130-002	MELTER FRAME LIFTING YOKE	PARTS DETAILS
SHIPPING FIXTURES					
H-2-120122	1	2	ME-130-001	POUR SPOUT DUMMY HEATER	ASSEMBLY
H-2-120122	2	2	ME-130-001	POUR SPOUT DUMMY HEATER	SUB-ASSEMBLY AND DETAIL
H-2-120123	1	2	ME-130-001	DUMMY INCONEL TUBE	ASSEMBLY AND PARTS LIST
H-2-120123	2	2	ME-130-001	DUMMY INCONEL TUBE	DETAILS
H-2-120124	1	1	ME-130-001	DUMMY DRAIN PLUG	ASSEMBLY AND PARTS LIST
H-2-120365	1	1	ME-130-001	RISER DUMMY HEATER	ASSEMBLY
H-2-120231	1	1	STANDARD PART	DOWEL PIN	
H-2-120232	1	1	STANDARD PART	ACME STUD	

ATTACHMENT B

RELATED DRAWINGS

DRAWING NO.	SHT	OF	TITLE		
H-2-68225	1	2	EQUIPMENT RECEPTACLE HOUSING ELECTRICAL CONNECTOR PUREX/REDOX TYPE		
H-2-68225	2	2	EQUIPMENT RECEPTACLE HOUSING ELECTRICAL CONNECTOR PUREX/REDOX TYPE		
H-2-83577	1	2	DETAILS AND ASSEMBLY 2 INCH - 3 WAY NOZZLE		
H-2-83577	2	2	DETAILS - 2 INCH - 3 WAY NOZZLE		
H-2-90185	2	2	MALE NOZZLE, 2 INCH PUREX		
H-2-90186	2	2	MALE NOZZLE, 3 INCH PUREX		
H-2-83401	1	1	LOWER ELECTRICAL	CONNECTION COMPONENTS	(FLOATING PINS)
H-2-83402	1	3	ELECTRICAL	EQUIPMENT CONNECTOR	PARTS
H-2-83402	2	3	ELECTRICAL	EQUIPMENT CONNECTOR	PARTS
H-2-83402	3	3	ELECTRICAL	EQUIPMENT CONNECTOR	PARTS
H-2-83399	1	1	ASSEMBLY	UPPER ELECTRICAL	EQUIPMENT CONNECTOR

DRAWING NO	SHT	OF	TITLE			
PROCESS AND INSTRUMENT DIAGRAMS						
H-2-123150	2	22	P&ID	SYSTEM 13	POUR TURNTABLE	
H-2-123150	5	22	P&ID	SYSTEM 13	MELTER DRAIN VALVE	AND DRAIN BELLOWS
H-2-123150	6	22	P&ID	SYSTEM 13	MELTER PRESSURE LEVEL	AND POUR CONTROLS
H-2-123150	7	22	P&ID	SYSTEM 13	MELTER TV CAMERA	COOLING AND CLEANING
H-2-123150	8	22	P&ID	SYSTEM 13	POWER AND CONTROL	FOR MELTER ELECTRODES
H-2-123150	9	22	P&ID	SYSTEM 13	PARTS AND CONTROL	FOR MELTER ELECTRODES
H-2-123150	10	22	P&ID	SYSTEM 13	DRAIN VALVE HEATERS	
H-2-123150	11	22	P&ID	SYSTEM 13	CCTV AND DRAIN VALVE	HEATER CONTROLS
H-2-123150	12	22	P&ID	SYSTEM 13	RISER AND POUR SPOUT	HEATER
H-2-123150	13	22	P&ID	SYSTEM 13	REFRACTORY TEMP.	MELTER DOME HEATERS
H-2-123150	14	22	P&ID	SYSTEM 13	MELTER DOME HEATERS	
H-2-123150	15	22	P&ID	SYSTEM 13	MELTER DOME HEATERS	
H-2-123150	16	22	P&ID	SYSTEM 13	MELTER COOLING WATER	
H-2-123150	17	22	P&ID	SYSTEM 13, PATH A	MELTER COOLING WATER	TOP AND BOTTOM HEADS AND SHELL
H-2-123150	18	22	P&ID	SYSTEM 13, PATH B	MELTER COOLING WATER	TOP AND BOTTOM HEADS AND SHELL
H-2-123150	20	22	P&ID	SYSTEM 13	MELTER COOLING WATER	ELECTRODES, PADS AND DOME HEATER TRANSFORMERS
H-2-123150	21	22	P&ID	SYSTEM 13	MELTER COOLING WATER	DOME HEATERS AND BOTTOM PAD
H-2-123250	1	15	P&ID	SYSTEM 14A	FILM COOLER	
H-2-123250	13	15	P&ID	SYSTEM 14A	BACKUP FILM COOLER	

ATTACHMENT C

PROCEDURE FOR EPOXY COATING OF MELTER VESSEL

1.0 **SCOPE**

1.1 This appendix covers surface preparation, epoxy coating and coating inspection procedures for the interior surfaces of melter vessels.

2.0 **PURPOSE**

2.1 The epoxy coating is designed to isolate the melter vessel wall from electric current in the glass melt pool. This provides a back-up to the primary refractory and ceramic fiber insulation layers. To satisfy stringent requirements for electrical isolation the epoxy must meet the highest standards for adhesion, freedom from defects and coating thickness. No deviation from the following procedures shall be permitted.

3.0 **SURFACE PREPARATION**

3.1 The surfaces to be coated include all internal surfaces of the shell, head and all nozzles. The nozzle flange faces or the bores of the "A" and "T" nozzles shall not be coated.

3.2 Buyer shall witness surface preparation in accordance with Paragraphs 3.3 and 3.4.

3.3 Remove oil and grease by detergent steam cleaning. Flush surfaces with demineralized water. Refer to Specification Section 13252 to remove alkaline residue.

3.4 Abrasive blast all surfaces to be coated in accordance with the following:

A. Schedule abrasive blasting to occur the same day the first coat is applied.

B. Abrasive blast in accordance with SSPC SP-10, Near White, all surfaces to be coated. DuPont Starblast® abrasive (or equivalent) shall be used, at 90-100 psi air pressure.

C. Buyer shall furnish a sample piece of Starblasted 304L stainless steel. This shall be used by Seller to ensure a proper anchor pattern for applying the first coat.

D. Remove all dust and abrasive from the surfaces prior to coating. Keep bare hands off the finished, cleaned surface.

E. After the surfaces have been blasted and cleaned, representative surface profile measurements shall be made using Press-O-Film or equal. The surface profile shall be 1 mil minimum. Buyer shall witness this surface profile check.

4.0 **EPOXY COATING** - Two-Component Solvent-Based Materials:

4.1 The coating system is based on Keeler & Long Inc. nuclear grade epoxy enamels and activators. The system is defined in the table below. A total minimum dry film thickness of 16 mils is required.

4.2 Table A

COAT NO.	LINING SYSTEM NUMBERS EPOXY ENAMEL	COLOR	WET FILM THICKNESS, MIN	DRY FILM THICKNESS, MIN
1	Primer: 6548/7107	White	9 mil	4 mil
2	Interim: 6548/7107	White Tinted	9 mil	4 mil
3	Finish Coat: E-2-0056	Medium Green	9 mil	4 mil
4	Topcoat: E-2-7975	Dawn Grey	9 mil	4 mil

4.3 Mix four volumes of epoxy base and one volume of activator. Allow to stand two hours before spraying.

4.4 Minimum recoating time is four hours.

4.5 The minimum surface temperature of the parts shall be 60°F just before spraying.

4.6 Minimum total dry film thickness shall be 16 mils. Because the paint is applied to a nonmagnetic (stainless steel) surface, a measuring device using eddy currents is required.

4.7 Wet film thickness may be checked at the time of application with a wet film thickness gauge to establish total dry film thickness to be obtained.

5.0 INSPECTION

5.1 Buyer shall witness and approve the blasted and cleaned surfaces in accordance with Paragraphs 3.4A and 3.4D.

5.2 A check for discontinuities or pinholes in the coating shall be made using a Tinker and Rasor Holiday Detector, Model M-1 (67 Volts) or equal. A small amount of household detergent shall be added to the water for this test. This test shall be witnessed by Buyer.

5.3 Pinholes or discontinuities shall be repaired as follows. Buyer shall witness and approve all repairs and the final check.

A. Determine whether pinholes are caused by defects in the metal substrate such as sharp corners, crevices, pits or weld spatter. If so, remove defects.

B. Wipe abraded areas with clean solvent (Keeler & Long Thinner #4093 or equal) in accordance with Specification Section 13252. Remove any dust or foreign matter.

C. Brush apply one coat of topcoat to affected area. Allow to dry tack-free for not less than four hours. Repeat this step until at least four coats have been applied.

D. Recheck for pinholes.

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 13251
FABRICATION AND INSTALLATION OF MELTER REFRACTORY AND INSULATION
B-595-P-P06A-13251

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3 X 4__

ORIGINATOR:

A Russell 12/18/92
A. Russell, Mechanical Engineer Date

CHECKER:

Dale A. Buzzelli 12-18-92
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

C. J. Divona Lead Discipline Engineer

12-18-92
Date

SECTION 13251
FABRICATION AND INSTALLATION OF MELTER REFRACTORY AND INSULATION
B-595-P-P06A-13251

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ATTACHMENTS

SECTION 13251
FABRICATION AND INSTALLATION OF MELTER REFRACTORY AND INSULATION

PART 1 GENERAL

1.1 SUMMARY

This specification section identifies the requirements for performance, fabrication, machining, testing, shipping, receipt, storage and installation of insulation and refractory in a glass melter vessel. This melter vessel will be installed and operated in the Hanford Waste Vitrification Plant (HWVP) at the Hanford Site, Richland, Washington.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C20	1987 Standard Test Methods for Apparent Porosity, Water Absorption, Apparent Specific Gravity, and Bulk Density of Burned Refractory Brick and Shapes by Boiling Water
ASTM C113	1987 Standard Test Method for Reheat Change of Refractory Brick
ASTM C133	1984 Standard Test Methods for Cold Crushing Strength and Modulus of Rupture of Refractory Brick and Shapes
ASTM C134	1988 Standard Test Methods for Size and Bulk Density of Refractory Brick and Insulating Firebrick
ASTM C201	1986 Standard Test Method for Thermal Conductivity of Refractories
ASTM C573	1981 Standard Methods for Chemical Analysis of Fireclay and High-Alumina Refractories
ASTM D3951	1990 Standard Practice for Commercial Packaging

ASTM E228	1985 (Rev. 89) Standard Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer

1.3 **RELATED REQUIREMENTS**

Specification Section 13250	Fabrication of Melter and Frame Assembly
Specification Section 13254W	Fabrication and Installation of Monofrax K3 Refractory

MELTER REFRACTORY AND INSULATION DRAWINGS

Drawings as listed in Attachment A.

FIXTURES AND GAUGES DRAWINGS

Drawings as listed in Attachment B.

MELTER REFRACTORY DRY OUT PROCEDURE

Procedure as described in Attachment C.

RELATED DRAWINGS

Drawings as listed in Attachment D.

1.4 **DEFINITIONS**

(Not Used)

1.5 **SYSTEM DESCRIPTION**

This refractory and insulation will serve as the lining in a melter vessel designed to vitrify radioactive waste material.

The melter assembly consists of a water-cooled cylindrical shell with dished heads, a layer of insulation and refractory lining. Energy for the melt is provided by immersed plate electrodes with additional energy being supplied by eight resistance heaters above the melt line.

There are no provisions for repair or replacement of refractory or insulation. If the refractory or insulation fails, the entire melter must be removed from service.

The conducting glass cannot be permitted to migrate through the refractory and insulation to the shell. Therefore, all refractory and insulation joints must be held to the tolerances specified on the Contract Drawings.

Fabrication of the melter and frame assembly is described in Specification Section 13250. Fabrication and installation of Monofrax K3 refractory is described in Specification Section 13254.

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Seller shall submit for Buyer review the following certified refractory test results:

A. Chemical analysis of each batch of Zirmul refractory and Superstructure refractory.

B. Bulk density of each Zirmul refractory block.

C. Bulk density of each batch of Superstructure refractory.

D. Cold crushing strength of each batch of Zirmul refractory and Superstructure refractory.

E. Apparent porosity of each batch of Zirmul refractory and Superstructure refractory.

1.6.2 Seller shall submit for Buyer review the following test results for each batch of molded insulation:

A. Chemical analysis.

B. Bulk density.

C. Cold crushing strength.

1.6.3 Seller shall submit the following procedures for Buyer approval:

A. Procedures which detail methods and sequences for fabrication of refractory and insulation.

B. Methods for measuring block dimensions using the gauging fixtures.

C. An inspection procedure which details the verification of surface appearance and conformance to dimensional and joint tolerances.

D. A procedure detailing methods and materials used for matchmarking.

E. A packaging and shipping procedure which details methods of protecting refractory from damage during handling and transit.

F. An installation procedure which details the refractory and insulation installation sequence, types of mortars and cement and methods of measurement and dimensional checks used to assure that the installation of insulation and refractory in the melter meet the dimensional requirements both of this specification section and Contract Drawings.

G. Refractory dryout procedures and temperature history in accordance with Paragraph 4.0 of Attachment C.

H. Procedures for welding, cleaning, painting, storing and shipping the forming and gauging fixtures.

1.6.4 Seller shall submit drawings of the fixture and gauges referenced in Paragraph 2.2.1 for Buyer approval.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Seller shall provide all labor, engineering, materials, equipment and facilities to fabricate and install refractory and insulation as follows:

A. Fabricate, machine and grind refractory and insulation to meet the chemical, physical and dimensional requirements both of this specification section and those drawings listed in Attachment A.

B. Test and certify refractory and insulation material.

C. Provide special forming and gauging fixtures identified in Attachment B to fabricate and measure the refractory and insulation.

D. Install and matchmark refractory in gauging devices for verification of fitup.

E. Store insulation and refractory at Seller's facility until scheduled for installation in the melter vessel at the vessel fabricator's facility.

F. Package and ship insulation and refractory to the melter vessel fabricator's facility.

G. Dry refractory at the vessel fabricator's facility in accordance with Attachment C.

H. Supply mortar, cement and pumpable insulation for installation of refractory and insulation identified in Paragraph 2.1.5.

I. Supply miscellaneous insulation blankets, paper and bulk fiber.

J. Install all insulation and refractory at the melter vessel fabricator's facility to meet the dimensional and quality requirements of this specification section and the applicable drawings.

K. Provide labor and facilities to store, protect and ship the forming and gauging fixtures to Buyer.

2.1.2 Sub-Base Refractory

2.1.2.1 Physical Property and Performance Requirements

All blocks shall be Zirmul, a ceramic-bonded alumina-zirconia-silica refractory. Blocks shall be rough cast with allowances for machining to the final dimensions and tolerances shown on the design drawings.

Seller shall cast sufficient extra blocks from each batch to be used for testing. One half of each extra block shall be furnished to Buyer. The other half shall be retained by Seller to test for the following performance requirements:

A. Chemical composition shall meet the following weight percentage requirements as determined by methods similar to ASTM C573:

• Aluminum oxide (Al_2O_3)	69.0 ± 2.0
• Zirconium dioxide (ZrO_2)	19.5 ± 2.0
• Silicon dioxide (SiO_2)	10.5 ± 2.0
• Other	1.0 maximum

B. The bulk density shall be greater than 2.93 gm/cm^3 as determined in accordance with ASTM C134. This shall be determined for each block.

C. Cold crushing strength shall be greater than 315 kg/cm^2 as determined in accordance with ASTM C133. This shall be determined for each batch.

D. The porosity shall not exceed 24 percent as determined in accordance with ASTM C20. This shall be determined for each batch.

E. Thermal conductivity shall not exceed 1.9 W/mC at 1150°C as determined in accordance with ASTM C201.

2.1.2.2 Surface Appearance

The following tolerances for surface appearance are the maximum allowable:

A. Maximum visible void size shall be 1/4 inch in diameter by 1/4 inch deep. There shall be no more than five such voids per square foot of surface.

B. Other surface voids shall not exceed 1/8 inch in diameter by 1/8 inch deep, compose more than thirty percent of the surface or exceed ten such voids per square inch of surface.

C. Surface checking of cast surfaces is acceptable. Checks shall not be more than 1/16 inch deep as measured by grinding and measuring with a depth gauge.

D. Cracks which penetrate the surface and can be traced more than one inch on two adjacent surfaces shall be cause for rejection.

E. Corner spalls shall not exceed 1/2 inch as measured along each edge. Edge spalls shall not exceed 1/4 inch as measured normal to the edge and shall not exceed twenty-five percent of any edge. Blocks shall be oriented at assembly such that adjacent corners and edges do not have coincident spalls.

F. Seller may meet these requirements by patching and re-burning.

2.1.2.3 Setup In Gauging Fixture

Seller shall assemble the completed blocks in the gauging fixture described in Paragraph 2.2.1 to verify the assembly meets the tolerance requirements of the drawings. This fixture shall be

used to hold the blocks for Blanchard grinding. It shall also be used as a shipping container as described on CBI Drawing 44993, Sheet 18 listed in Attachment B. Seller shall matchmark the assembled refractory blocks such that they can be reassembled in the melter shell at a later date in the exact location and orientation.

2.1.3 Superstructure Refractory

2.1.3.1 Physical Property and Performance Requirements

All blocks shall be a cast high-alumina refractory. Blocks shall be cast to the final dimensions and tolerances shown on the design drawings.

Seller shall cast extra blocks from each batch to be used for testing. One half of each extra block shall be furnished to Buyer. The other half shall be retained by Seller to test for the following performance requirements:

A. Chemical composition shall meet the following weight percentage requirements as determined in accordance with ASTM C573:

• Aluminum oxide (Al_2O_3)	88.0	minimum
• Silicon dioxide (SiO_2)	11.0	maximum
• Ferric oxide (Fe_2O_3)	0.3	maximum
• Alkali (Na_2O, K_2O, Li_2O)	.35	maximum
• Other	1.0	maximum

B. The bulk density shall be greater than 2.9 gm/cm^3 as determined in accordance with ASTM C134.

C. Cold crushing strength shall be greater than 350 kg/cm^2 as determined in accordance with ASTM C133.

D. The porosity shall not exceed 25 percent as determined in accordance with ASTM C20.

E. Mean coefficient of thermal expansion shall not exceed 8.5 x 10^{-6} cm/cm/°C as determined in accordance with ASTM E228.

F. Thermal conductivity shall not exceed 3.2 W/m°C at 1150°C as determined in accordance with ASTM C201.

G. Reheat change shall not exceed 0.2 percent as determined in accordance with ASTM C113.

2.1.3.2 Surface Appearance

All brick and shapes shall be free of voids, cracks and laminations. They shall have sharp, well-bonded edges, corners and outer surfaces.

2.1.3.3 Setup In Gauging Fixture

A. Seller shall assemble the completed top head refractory blocks in the gauging fixture described in Paragraph 2.2.1 to verify the assembly meets the tolerance requirements of the Contract Drawings.

B. Seller shall assemble the sidewall refractory on a horizontal surface that is flat within 1/32 inch over the 97 inch diameter to verify the assembly meets the inside and outside diameter requirements of the Contract Drawings.

C. Seller shall matchmark the assembled refractory blocks such that they can be reassembled in the melter shell at a later date in the exact location and orientation.

2.1.4 Molded Insulation

2.1.4.1 Physical Property and Performance Requirements

All molded insulation shall be T30L molded Fiberfrax, an alumina-silica ceramic-based fiber. Insulation shall be formed in the appropriate fixtures listed in Attachment B. It shall be ground to the dimensions and tolerances shown on the Contract Drawings.

Seller shall cast extra segments from each batch to be used for testing. One half of each segment shall be furnished to Buyer. The other half shall be retained by Seller to test for the following performance requirements:

A. Chemical analysis shall be performed on each batch prior to addition of binder in accordance with ASTM test method C573. Chemical composition shall contain 44-52 percent aluminum oxide, 48-56 percent silicon oxide and a maximum of 1 percent impurities.

B. Bulk density shall be determined in accordance with ASTM C134.

C. Cold crushing strength shall be determined in accordance with ASTM C133.

2.1.4.2 Assembled Tolerances

The bottom corner liner segments shall be temporarily assembled with the bottom head liner to check fitup. Maximum gap shall not exceed 1/16 inch. The outside diameter of the assembled bottom head and bottom corner liner configurations shall be measured and recorded.

2.1.5 Miscellaneous Insulation and Mortars

A. Ceramic fiber paper, blanket and pumpable insulation material shall be as follows:

Blanket	-	Fiberfrax Durablanket
Paper	-	Fiberfrax 970-JH
Pumpable	-	Fiberfrax DSM-24 (shall contain a nominal of 24% colloidal solids and shall be purchased so that at least 1 month shelf life remains at time of installation)

B. Riser and pour spout insulation material shall be:

Zircar AL-30
Zircar ZAL-15

C. Mortars and cement shall be as follows:

Zirmul	-	Shamrock 391 Chrome-Alumina
Vapor Space Refractory	-	Mortar compatible with alumina refractory
Fiberfrax Paper	-	Fiberfrax Coating Cement QF-180

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 Fixture and Gauges

Special fixtures are required to fabricate and measure the refractory and insulation. These fixtures shall be fabricated by Seller and will be reused on future melters. These fixtures become the Buyer's property.

The fixture drawings are listed in Attachment B. They were prepared by Chicago Bridge and Iron (CBI) for the Defense Waste Processing Facility (DWPF) at the U.S. Department of Energy Savannah River Site.

Seller shall prepare fixture drawings based on the CBI drawings except that references to du Pont specifications, drawings, purchase order numbers, etc. will be replaced with appropriate

Seller callouts. This shall include cleaning, painting and welding requirements.

Fixtures are described as follows:

A. Gauging fixture to align and fitup Superstructure refractory blocks in the top head.

B. Grinding and gauging fixture to align and fitup Zirmul refractory blocks.

C. Fixtures to form and trim top head molded insulation.

D. Fixtures to form and trim sidewall molded insulation.

E. Fixtures to form and trim bottom head molded insulation.

F. Fixtures to grind top and bottom head molded insulation to final thickness and contour.

2.2.2 Installation Requirements

2.2.2.1 Seller shall install refractory and insulation in the melter vessel and head at the vessel fabricator's facility. Following installation of the pumpable insulation, Seller shall dry the vessel as described in Attachment C.

2.2.2.2 Extreme care must be taken to prevent damage to the epoxy coating on the inside surfaces of the melter vessel and head. This coating serves as corrosion protection and is the final electrical isolation. Scribing of layout lines with a pointed tool is not permitted.

2.2.2.3 All pre-formed refractory shall be handled with care to avoid chipping or breaking. Any materials damaged by Seller shall be replaced at no charge to Buyer. Chipped or broken brick shall not be used in this vessel unless prior written review and approval is obtained from Buyer.

2.2.2.4 Refractory shall be installed by refractory brick masons experienced in high temperature glass furnace construction. Qualified supervision familiar with all aspects of the job shall be on site at all times while work is in progress.

2.2.2.5 Refractory material shall be maintained at a temperature of 60°F to 95°F during installation.

2.2.2.6 Tools used in refractory installation shall be rubber or plastic coated or non-metallic to avoid chipping edges of blocks.

2.2.2.7 Where permitted, refractory may be cut with masonry saws with diamond blades only. No chipping or hammer cuts are permitted. No brick less than half its original size shall be installed. No brick shall be installed which is smaller on the back face than the exposed face.

2.2.3 Preparation for Shipping

Seller shall package the refractory and insulation. Packaging shall be subject to inspection by Buyer to ensure against damage during handling and transit. This protection shall include:

A. Packaging the Zirmul refractory in the gauging fixture.

B. Sturdy wood crates which meet or exceed the minimum requirements of ASTM D3951.

C. Additional protection for corners and machined surfaces.

D. Use of pallets to permit forklift loading and unloading.

E. Provisions to minimize stresses on packed refractory and insulation.

F. Use of a dedicated truck with weather protection.

G. Seller shall package forming and gauging fixtures for storage and shipping subject to inspection by Buyer to ensure against damage.

H. Seller shall clean all fixtures of rust and debris.

I. Fixture machined surfaces shall be coated with a hard coating-type rust preventive such as Tectyl 890 (manufactured by Ashland Oil and Refining Co.) or equal.

J. The fixtures shall be packaged in sturdy wood crates.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

MELTER REFRACTORY AND INSULATION

DRAWING NO.	SHT	OF	TITLE		
H-2-120242	1	18	ME-130-001	Melter Refractory/Insulation	Parts List
H-2-120242	2	18	ME-130-001	Melter Refractory/Insulation	Assembly
H-2-120242	3	18	ME-130-001	Melter Refractory/Insulation	Installation Dimensions
H-2-120242	4	18	ME-130-001	Melter Refractory/Insulation	Installation Dimensions
H-2-120242	5	18	ME-130-001	Melter Refractory/Insulation	Superstructure Refractory
H-2-120242	6	18	ME-130-001	Melter Refractory/Insulation	Superstructure Refractory
H-2-120242	7	18	ME-130-001	Melter Refractory/Insulation	Superstructure Refractory
H-2-120242	10	18	ME-130-001	Melter Refractory/Insulation	Zirmul Refractory
H-2-120242	11	18	ME-130-001	Melter Refractory/Insulation	Head Liner Details
H-2-120242	12	18	ME-130-001	Melter Refractory/Insulation	Side Liner Details
H-2-120242	13	18	ME-130-001	Melter Refractory/Insulation	Ring and Sleeve Details
H-2-120242	14	18	ME-130-001	Melter Refractory/Insulation	Riser Outer Insulation
H-2-120242	15	18	ME-130-001	Melter Refractory/Insulation	Riser Inner Insulation
H-2-120242	16	18	ME-130-001	Melter Refractory/Insulation	Pour Spout Outer Insulation
H-2-120242	17	18	ME-130-001	Melter Refractory/Insulation	Pour Spout Inner Insulation
H-2-120242	18	18	ME-130-001	Melter Refractory/Insulation	Riser End Details

ATTACHMENT B

FIXTURES AND GAUGES

DRAWING NO.	SHT	REV	TITLE
44993	0-1	1	List of Drawings, References and General Notes
44993	1	0	Bottom Head Forming Fixture Assembly
44993	2	0	Bottom Head Trim Fixture Assembly
44993	3	2	Bottom Head Trim Fixture
44993	4	3	Bottom Head Forming Fixture
44993	5	2	Bottom Head Forming Fixture
44993	6	0	Top Head Forming Fixture
44993	8	3	Top Head Trim Fixture
44993	9	3	Top Head Forming Fixture
44993	10	2	Top Head Forming Fixture
44993	16	2	Forming and Trim Fixture Assembly
44993	17	1	Forming and Trim Fixtures (Sidewall)
44993	18	0	Zirmul Fixture Assemblies
44993	19	2	Zirmul Fixture Assemblies
44993	20	1	Zirmul Fixture Assemblies
44993	21	1	Trammel, Contour and Flatness Template Assemblies
44993	22	1	Template Support Arm, Contour and Flatness Template
44993	23	7	Zirmul Fixture Base
44993	23A	0	Stiffeners for Zirmul Fixture Base
44993	24	2	Zirmul Fixture Dummy Block
44993	25	1	Zirmul and K3 Shaft Posts
44993	26	1	Zirmul and K3 Fixture Details
44993	27	0	Zirmul Fixture Clamp Plate
44993	28	0	Zirmul Fixture - Spanner Wrench and Nuts
44993	29	1	Locating Template
44993	PD1	5	Zirmul and K3 Fixture Details, Fixtures for Melter Vessel
44993	PD2	1	Zirmul and K3 Fixture Details, Fixtures for Melter Vessel
44993	PD3	1	Zirmul and K3 Fixture Details, Fixtures for Melter Vessel

ATTACHMENT C

MELTER REFRACTORY DRY OUT PROCEDURE

1.0 PURPOSE

1.1 The objective of this procedure is to dry residual moisture from the refractory lining and insulation in the shell sidewall and bottom. Most of this originates in the pumpable insulation which is installed as a water-based slurry between the Monofrax K3 refractory and shell wall. This water must be evaporated by heating the vessel cavity with a burner in a carefully controlled manner to satisfy the following conditions:

- Control heat up and cool rates to avoid thermal shock to the refractory.
- Control the burner and exhaust flow condition during the dryout to maintain the inside surfaces of the shell wall at 220°F to 300°F. The upper limit is necessary to protect the epoxy lining on the inside of the shell. Temporary excursions to 350°F on the shell interior are permissible, but the intent is to limit the maximum to 300°F to maintain an adequate safety margin.

These conditions are achieved by concentrating the heat in the lower section of the shell using selective insulation of the melter shell bottom and side walls, and continuous monitoring of the inside shell wall temperature with thermocouples. The recommended set up is shown in Figures 1 through 5.

2.0 DIVISION OF RESPONSIBILITY

2.1 Seller shall provide and install the following:

- Insulated steel cover and 12-inch diameter insulated ductwork for exhaust (Figures 1 and 2).
- Fiberglass insulation for shell exterior (Figure 3).
- Kaowool insulation for shell nozzles (Figure 2).
- Thermocouples and wire (Figures 4 and 5).
- Natural gas or a propane tank for the burner.
- Chart recorder.
- Burner and blower.
- Hose for the gas supply and blower.

3.0 PROCEDURE

It is preferable to have the melter indoors and at ambient temperatures during the drying operation. An outdoor location is acceptable if the melter is protected from the weather, including wind, and the minimum ambient temperature is above 50°F. This is necessary to avoid freezing the water in the pumpable insulation.

The dryout procedure shall be performed as follows. Seller shall record all thermocouple readings every hour on the strip chart. In addition, the thermocouple data must be plotted on a graph during the critical heat-up stage. Seller shall provide 24 hour-per-day supervision of the drying process.

3.1 Heat up at a rate of 20°F per hour to 600°F internal air temperature. This is an initial boost to reduce heat-up time.

3.2 Hold at 600°F for 12 hours. The soak time at 600°F may be reduced from the 12 hour limit if the projection of the transient shell temperature profile indicates that it will overshoot 300°F.

3.3 Reduce from 600°F to 500°F at 20°F per hour. The 500°F limit is the steady state temperature required to heat the pumpable insulation temperature above 212°F while maintaining the internal shell temperature at or below 300°F.

3.4 Hold at 500°F until an analysis is made to determine sufficient dryness, usually for 3 to 4 days. During this time, adjustments may be made to the internal temperature as necessary to maintain the internal shell temperature between 220°F and 300°F.

3.5 Cool from 500°F to 400°F at 20°F per hour. After the temperature reaches 400°F the burner shall be shut off and removed, the burner opening closed off and the damper at the end of the exhaust duct closed. From this point, the melter will cool down naturally without further temperature control. Seller will disconnect the recorder and pack up the equipment. After completion of cooldown (4 to 6 days after the burner is removed) thermocouples shall be removed.

4.0 SUBMITTALS

4.1 Seller shall submit a complete procedure for the refractory dryout for Buyer approval.

4.2 Seller shall submit temperature vs. time charts to Buyer.

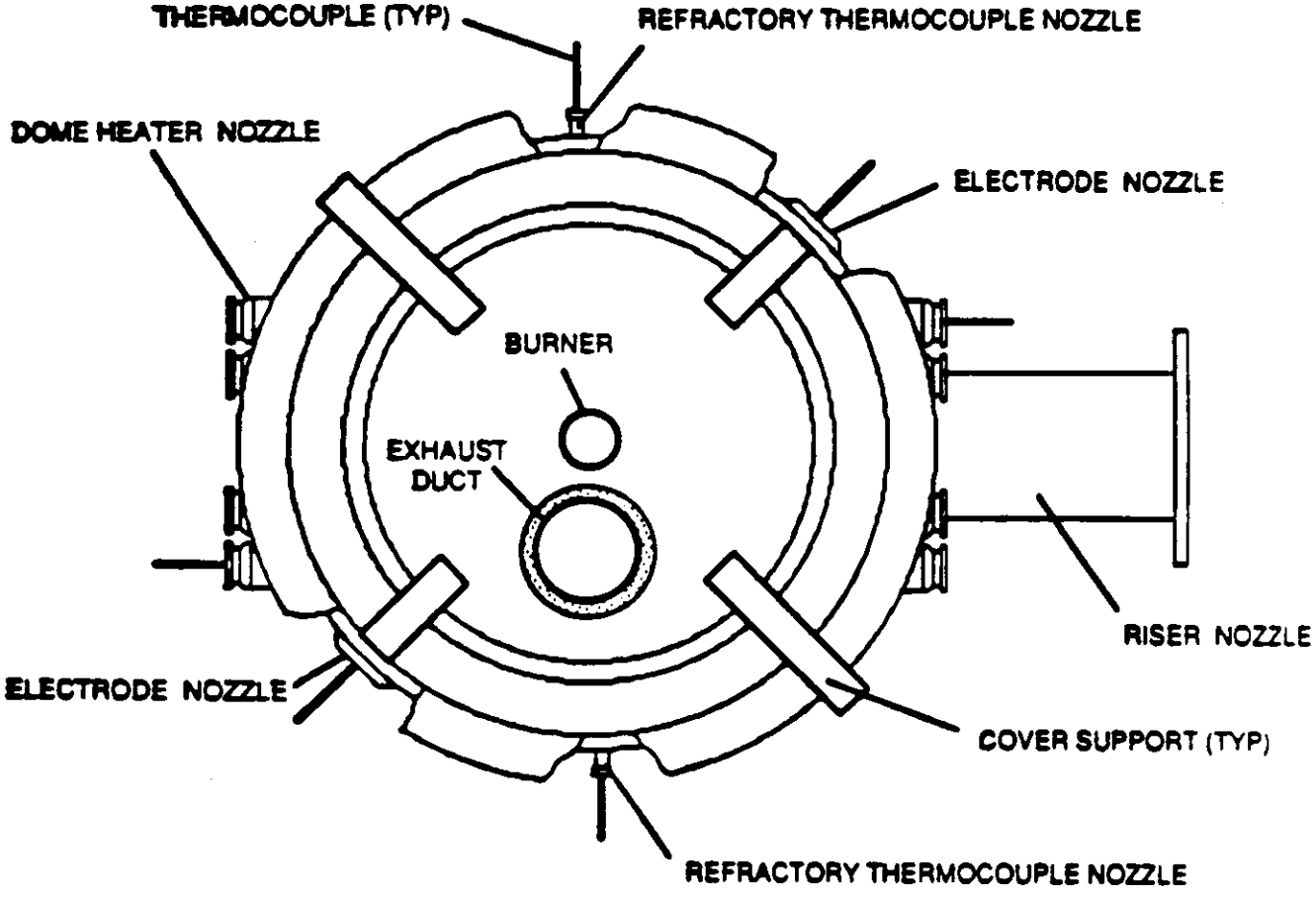


FIGURE C-1 - REFRACTORY DRY-OUT (PLAN VIEW)

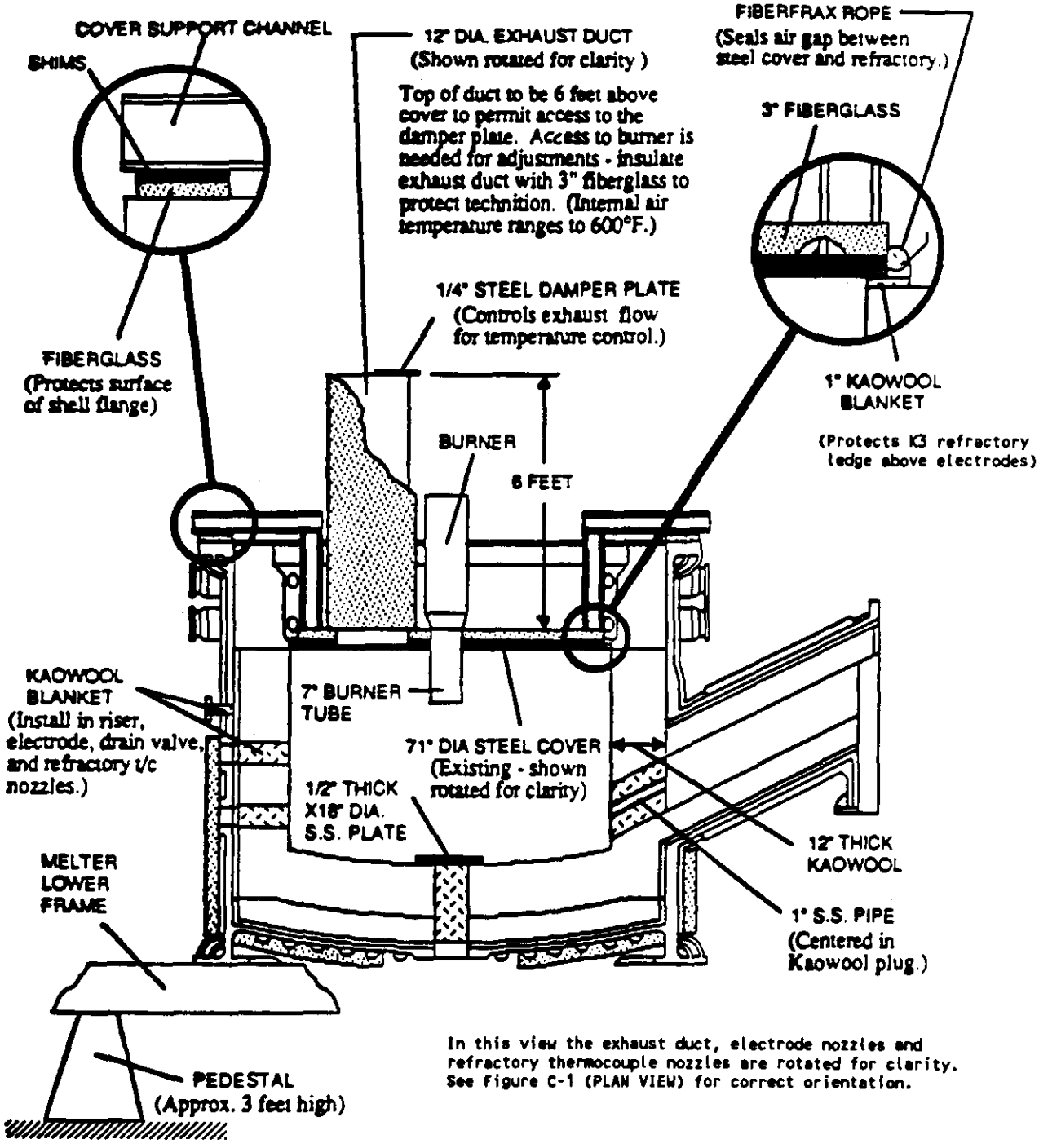
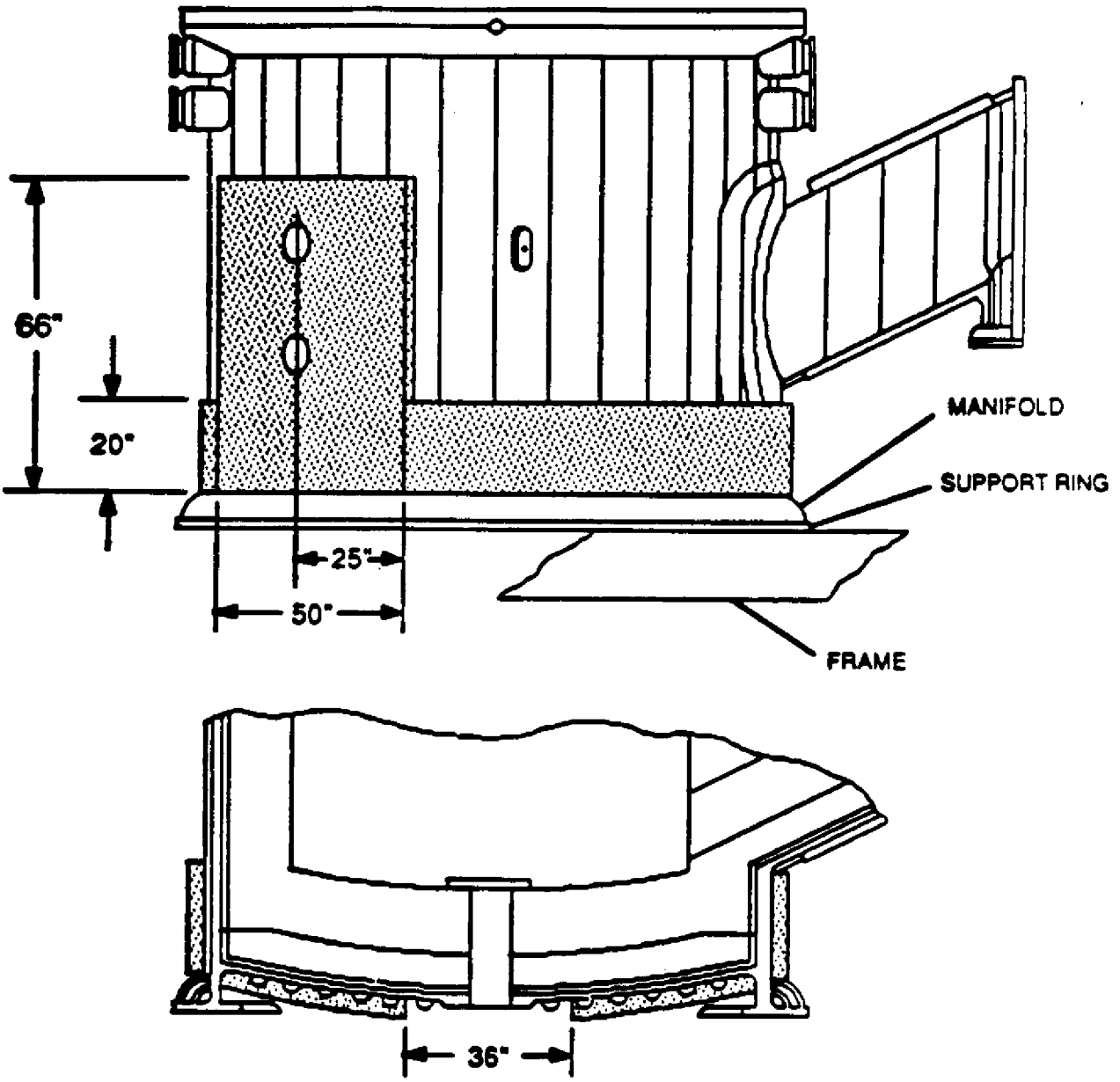


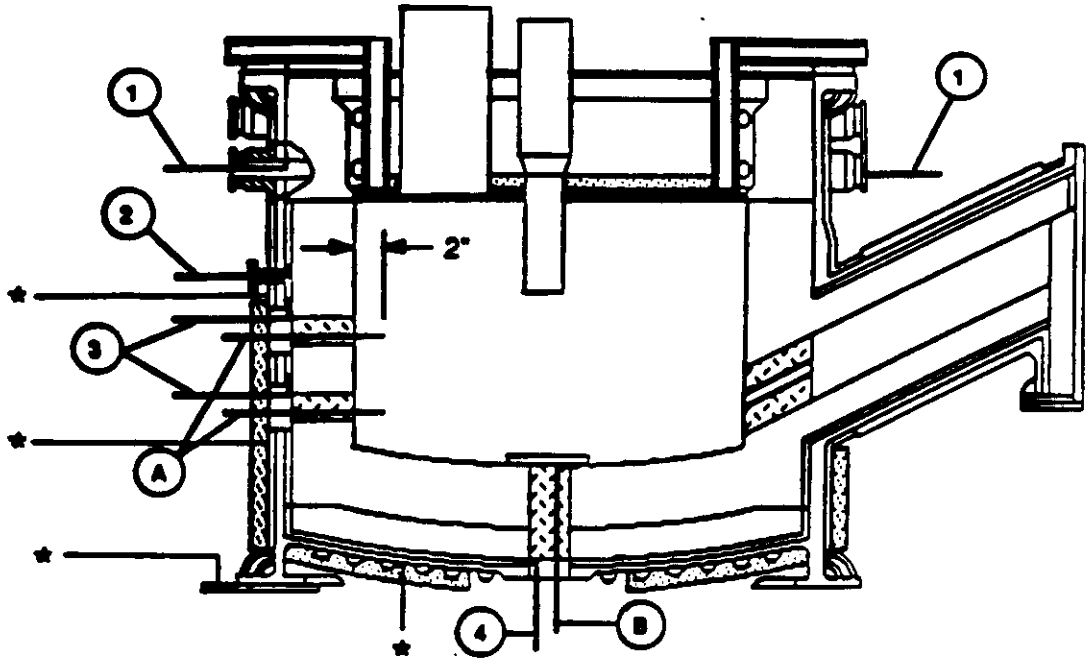
FIGURE C-2 - REFRACTORY DRY-OUT (SECTION VIEW)



Insulate exterior of melter shell as shown, using 3" thick fiberglass without a vapor barrier. Center insulation on electrode nozzles (two sides). Do not insulate the manifold or support ring. Leave a 36" diameter opening on the bottom centered on the bottom nozzle.

This selective insulation evens out temperature differences due to different refractory thicknesses, and concentrates the heat near the bottom to dry the fiberfrax liner.

FIGURE C-3 - REFRACTORY DRY-OUT (EXTERIOR INSULATION DETAILS)



THERMOCOUPLE REQUIREMENTS FOR TEMPERATURE CONTROL

In this view the exhaust duct, electrode nozzles and refractory thermocouple nozzles are rotated for clarity. See Figure C-1 (PLAN VIEW) for correct orientation. Thermocouple installation details are shown in Figure C-5.

(1) (2) Shell surface, one in each side on lower dome heater nozzle. (For info. only - not for control.)

(2) (2) Shell surface in refractory T.C. nozzle, inserted into DSM-24 insulation.

(3) (2) Shell surface, one in each electrode nozzle, inserted into DSM-24 insulation.

(4) (1) Shell surface in drain valve nozzle, inserted into T30L molded Fiberfrax.

(A) (4) Temperature control, inserted through electrode nozzles, extended 2" from inside wall.

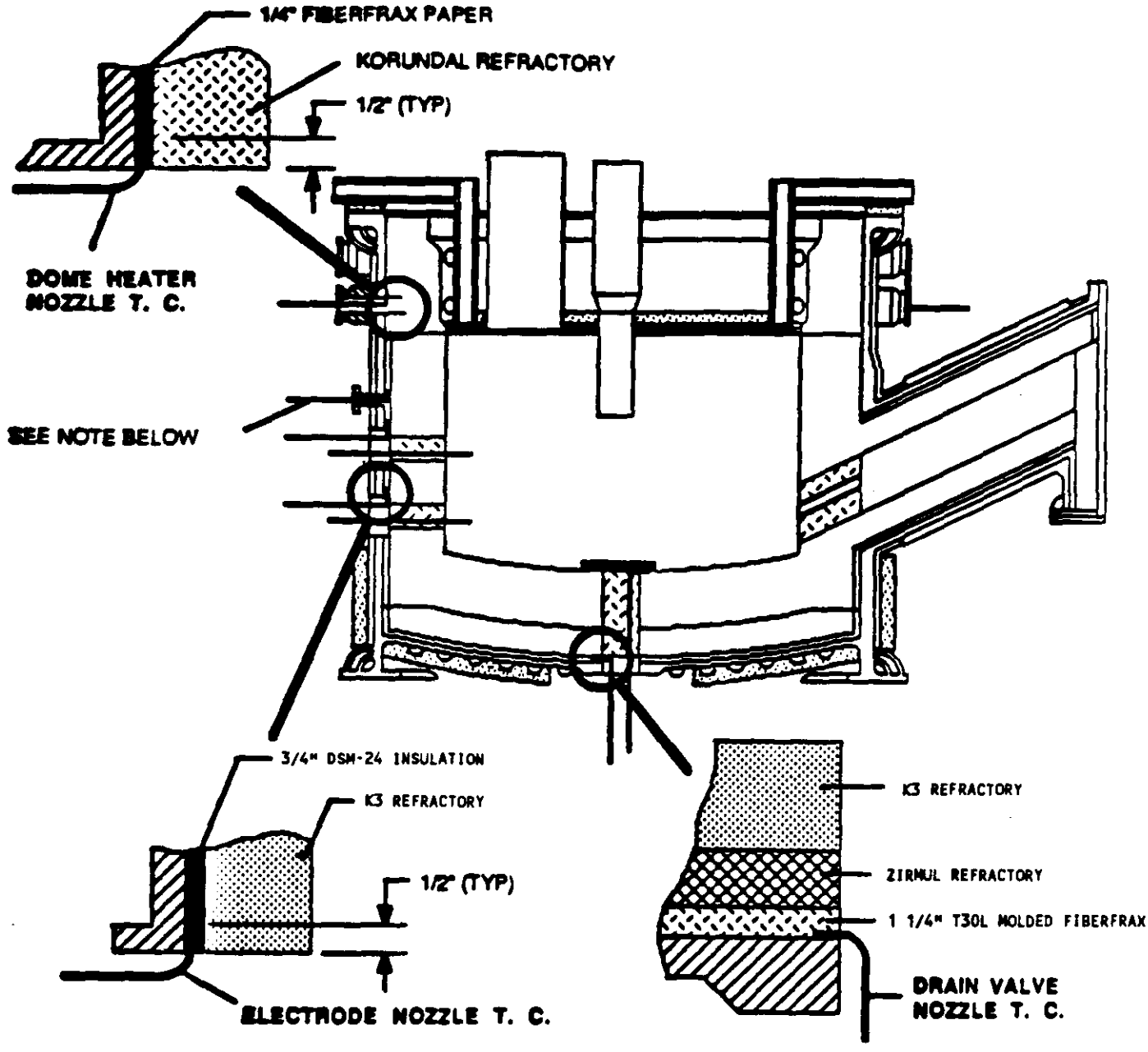
(B) (1) Temperature control, inserted through drain valve nozzle, between stainless steel plate and K3 refractory.

All thermocouples furnished by Seller. Item (A) T.C.s are 24" long, all others are 18" long.

* For information only, install four additional thermocouples to outer surfaces as follows:

Install two where there is no insulation - one near the refractory thermocouple nozzle and one on the support ring. Install two on the insulated surfaces - one near the electrode nozzle and one on the bottom 2 feet from the nozzle. Dryout Contractor will install these via capacitive discharge.

FIGURE C-4 - REFRACTORY DRY-OUT (THERMOCOUPLE REQUIREMENTS)



In this view the exhaust duct, electrode nozzles and refractory thermocouple nozzles are rotated for clarity. See Figure C-1 (PLAN VIEW) for correct orientation. Install thermocouple close up against the melter shell with a 1/2-inch length contact as shown. Install with care to avoid scratching the epoxy coating inside the nozzles and shell. A leg shorter than 1/2 inch may be necessary on the two refractory thermowell thermocouples due to the small nozzle I.D.

FIGURE C-5 - REFRACTORY DRY-OUT (THERMOCOUPLE INSTALLATION DETAILS)

ATTACHMENT D

RELATED DRAWINGS

DRAWING NO.	SHT	OF	TITLE		
H-2-120235	6	12	ME-130-001	Melter Top Head	Nozzles F1, F6, G18
H-2-120075	1	1	ME-130-001	Melter Shell	Inconel Dam Assembly

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 13252
PRECAUTIONS FOR FABRICATION, HANDLING AND STORAGE OF STAINLESS STEEL AND NICKEL ALLOYS
B-595-P-P06A-13252

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3 X 4__

ORIGINATOR:

Andrew Estrada 12/8/92
A. Estrada, Welding Engineer Date

CHECKER:

Dale A. Buzzelli 12-18-92
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

C. J. Divona
C. J. Divona Lead Discipline Engineer

12-18-92
Date

SECTION 13252
PRECAUTIONS FOR FABRICATION, HANDLING AND STORAGE OF STAINLESS STEEL AND NICKEL ALLOYS
B-595-P-P06A-13252

TABLE OF CONTENTS

SECTION 13252
PRECAUTIONS FOR FABRICATION, HANDLING AND STORAGE OF STAINLESS STEEL AND NICKEL ALLOYS

PART 1 GENERAL

1.1 SUMMARY

This specification section outlines the requirement for handling, fabrication, shipment and storage techniques to minimize the risk of contamination of stainless steel and nickel alloys. Contaminating compounds are those which contain free iron, sulfur, chlorides and low melting point metals. Typical sources of contamination are listed below:

* carbon steel brushes, chains, hooks etc.
* adhesive/pressure sensitive tapes
* Grinding/abrasive disks
* marking material
* lubricants
* nondestructive examination materials
* cleaning fluids
* hydrostatic test water

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME N45.2.1	1980 Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants

AMERICAN SOCIETY FOR TESTING OF MATERIAL (ASTM)

ASTM A380	1978 Standard Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
ASTM D129	1991 Standard Test Method for Sulfur in Petroleum Products (General Bomb Method)
ASTM D808	1991 Standard Test Method of Chlorine in New and Used Petroleum Products (Bomb Method)

ASTM D1552	1990 Standard Test Method for Sulfur in Petroleum Products (High-Temperature Method)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Code

ASME Section V	1989 Nondestructive Examination

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR Chapter 1, Part 143	1990 Nation Secondary Drinking Water Regulations

1.3 **RELATED REQUIREMENTS**

(Not Used)

1.4 **DEFINITIONS**

ppm - Parts Per Million

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirement section of the Order/Subcontract.

1.6.1 Seller's procedure for handling, cleaning, isolation and storage of stainless steel and nickel alloys shall be submitted for Buyer approval. These procedures shall be submitted prior to the start of fabrication.

1.6.2 Chemical analysis reports for materials that are not intended to be removed after fabrication shall be submitted for Buyer review. Examples of these materials are: lubricants, thread compound, nondestructive examination materials, etc.

1.6.3 Seller's procedure for drying of equipment and piping shall be submitted for Buyer approval. The procedure shall identify the means of verifying that all water has been dried from pockets and low points after hydrostatic testing.

1.6.4 Biocide water treatment procedure shall be submitted for Buyer approval in accordance with Paragraph 2.2.4.2.

1.6.5 Water chemistry and biocide material data sheet shall be submitted for Buyer approval. This information shall be submitted prior to hydrostatic testing.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 All limitations specified, e.g., percent, parts per million (ppm) etc. are to be by weight.

2.1.2 All consumables and materials used during fabrication shall meet the following general requirements unless addressed in more detail in this specification:

2.1.2.1 Maximum chloride content shall be 250 ppm.

2.1.2.2 Maximum sulfur content shall be 1 percent.

2.1.2.3 Low melting point elements (such as cadmium, lead, mercury, tin and zinc) shall not be added.

2.1.3 Carbon Steel Contamination

2.1.3.1 Tools and equipment used to cut, form and handle stainless steel and nickel alloys shall be in accordance with one of the following requirements:

A. Tools and equipment shall be hardened tool steel or chrome plated steel.

B. Surfaces of non-stainless steel tools and equipment which come into contact with stainless steel shall be covered either with paper, plastic or stainless steel sheet.

2.1.3.2 Grinding equipment and stainless steel wire brushes previously used on carbon steel shall not be used on stainless steel and nickel alloys.

2.1.3.3 Temporary attachments for welding or fabrication shall be of a similar grade material (e.g., 300 series stainless steel shall be used for a temporary attachment to 304L stainless steel) to the pressure component.

2.1.3.4 If scaffolding or ladders are used during fabrication, the contact surfaces at the stainless steel or nickel alloy interface shall be protected either by wood or plastic. No direct contact shall be permitted.

2.1.3.5 Areas used for fabrication of stainless steel and nickel alloys shall be separate from carbon steel fabrication areas. These areas shall be kept free of carbon steel shavings and grinding dust.

2.1.3.6 Where it is not possible to provide protection from carbon steel, the components shall be chemically cleaned to dissolve any carbon steel which may be embedded in the stainless steel or nickel alloy surface. The acceptable amount of contamination and cleaning requirements shall be in accordance with Paragraph 2.1.3.10.

2.1.3.7 Non-metallic slings shall be used when safe to do so. Lifting with carbon steel chains from lifting lugs is acceptable. Chemically clean lugs prior to shipment of equipment. Cleaning shall be in accordance with Paragraph 2.1.3.6.

2.1.3.8 Carbon steel strapping material used for shipping shall not contact stainless steel or nickel alloy equipment or piping.

2.1.3.9 Walking directly upon stainless steel surfaces shall be prohibited where possible. Surfaces upon which walking access is required shall be protectively covered with kraft paper, cardboard, plastic or equivalent.

2.1.3.10 Acceptable Carbon Steel Contamination

Scattered areas of carbon steel contamination (as evident by rust) are permissible provided the aggregated area does not exceed 2 sq. in. in any 1 sq. ft. area. Carbon steel contamination shall be verified in accordance with ASTM A380.

Surfaces that are found to be contaminated with carbon steel shall be restored. Mechanical and chemical descaling is acceptable. Descaling shall be performed in accordance with ASTM A380.

2.1.4 Wrapping and Protective Covering Materials

2.1.4.1 No chloride restriction shall apply to wrapping and protective covering material (such as polyethylene and polyvinyl chloride (PVC) films) when used for packaging or storage purposes. PVC caps, plugs and packaging material shall not be reused.

2.1.4.2 No chloride restriction shall apply to pressure-sensitive tapes or adhesive-backed tapes. Pressure-sensitive tapes or adhesive-backed tapes shall not be used within 12 inches of any area where local heating or welding may increase the metal temperature to 180°F or higher.

2.1.4.3 Where tape is used during welding for back purging, the tape shall be of a type containing less than 250 ppm chlorides (Stockwell Rubber Company G-568 or equal).

2.1.4.4 After pressure-sensitive and adhesive-backed tapes are no longer required they shall be removed. Any remaining residual adhesive shall be removed. Acetone or solvent shall be used. Solvent shall be in accordance with Paragraph 2.1.7.

2.1.5 Grinding Discs, Abrasive Discs, Brushes and Material Removal Tools

2.1.5.1 Grinding discs, abrasive discs and brushes shall be designated for use on stainless steel and nickel base alloys. These materials shall not have been previously used on carbon steel, low alloy steels or nonferrous metals and their alloys.

2.1.5.2 Grinding discs, abrasive discs and belts shall be of resin bonded alumina, silicon carbide or zirconium carbide. Sulfurized compounds shall not be used as a bonding material.

2.1.5.3 Only 300 series stainless steel brushes shall be used on stainless steel and nickel base alloys.

2.1.5.4 All material removal and cleaning tools shall be marked to identify that they are to be used on stainless steel and nickel alloys only.

2.1.6 Nondestructive Examination Materials

2.1.6.1 Sulfur and halogen content of liquid penetrant materials shall be in accordance with the requirements of T-625, Article 6, ASME Section V.

2.1.7 Cleaning Fluids

Chlorinated hydrocarbon solvents may be used for stainless steel cleaning provided they are analyzed for total residual chlorine and sulfur. The analysis process is as follows:

A. Select and weigh a glass Petri dish of 150mm nominal diameter. Note the weight.

B. Pour a 100 gram sample of the solvent into the Petri dish.

C. Heat the sample for 60 minutes. The heating temperature shall be between 194°F and 212°F, inclusive.

D. Weigh the Petri dish again. Subtract the weight noted in Step A from the new weight. This is the weight of the solvent residue.

1) If the residue is less than 0.005 grams, the solvent is acceptable. No further analysis is required.

2) If the residue weight is 0.005 grams or more, repeat Steps A through C. Test the residue in accordance with ASTM D129 or ASTM D1552 for sulfur content. Test the residue in accordance with ASTM D808 for halogen content.

The sulfur and chlorine content shall not exceed 1 percent of the residue by weight in any case.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 Hydrostatic Test Water Quality

The intent of the following guidelines is to minimize the risk of chloride stress corrosion cracking (SCC) and microbiological influenced corrosion (MIC).

2.2.2 Water quality shall meet the following requirements for the melter vessel only, not including cooling water jackets or cooling water piping.

2.2.2.1 Water used for testing shall be clean, filtered, chlorinated water. The free residual chlorine content shall not be more than 0.1 ppm. It shall be in accordance with the following water chemistry and requirements:

A. pH at 77 °F shall be 5.5 to 8.0.

B. Chloride content shall be less than 250 ppm.

C. Fluoride content shall be less than 5 ppm.

D. Sulfide content shall be less than 1 ppm.

E. Total dissolved solids shall be less than 500 ppm.

F. Treated with a biocide for the specific normal population of bacteria.

Potable water which meets the Code of Federal Regulations 40 CFR, Ch.1, Part 143 requirements should satisfy these chemistry limits.

The test water shall be analyzed before equipment and piping is filled. The water's free residual chlorine content shall be determined.

2.2.2.2 Test water and melter vessel shell surface temperature shall not exceed 140 °F at any time during hydrostatic test or drying operations. If a temperature in excess of 140 °F is necessary to dry melter vessel, deionized water shall be used. Deionized water shall meet the requirements of Paragraph 2.2.3.

2.2.2.3 The melter vessel shall be completely drained and thoroughly dried within 48 hours of hydrostatic testing. Acceptable methods of drying include mopping, wiping or blow drying with cool (less than 140 °F) nitrogen. Seller shall submit a drying procedure in accordance with Paragraph 1.6.3.

2.2.3 Deionized water shall be used for hydrostatic testing of cooling water jackets and cooling water piping. The water and methods shall be in accordance with the following Paragraphs.

2.2.3.1 Deionized water shall meet the following requirements:

A. pH at 77 °F shall be 5.5 to 8.0.

B. Chloride content shall be less than 1 ppm.

C. Fluoride content shall be less than 1 ppm.

D. Sulfide content shall be less than 1 ppm.

E. Conductivity at 77 °F shall not exceed 3 micromho/cm.

F. Silica content shall not exceed 0.05 ppm.

G. Total suspended solids shall not exceed 3 ppm.

H. Treated with a biocide for the specific normal population of bacteria.

Steam condensate or demineralized water should satisfy the above requirements. The above water chemistry requirements are in accordance with ASME N45.2.1.

The test water shall be analyzed before cooling jackets and cooling water piping is filled.

2.2.3.2 All openings shall be sealed and maintained in clean condition once testing is complete.

2.2.3.3 Any hydrostatic test condition or procedure not addressed by the above paragraphs shall be submitted to Buyer for approval prior to the start of testing.

2.2.4 Extended Hydrostatic Test

2.2.4.1 If melter vessel, cooling water jackets or cooling water piping is subjected to extended hydrostatic test or wet layup condition (greater than 72 hours) the test water shall analyzed for microbiological contamination. An acceptable biocide test kit shall be used (Bioindustrial Technologies Incorporated - MICKIT™ or equal).

2.2.4.2 If necessary, the water shall be treated on a daily basis with a biocide to minimize the risk of microbiological contamination. Acceptable biocides are chlorine (0.2 ppm residual), hydrogen peroxide and ozone (0.1 ppm residual). Seller shall select the proper biocide according to the analyzed water chemistry. Seller shall also submit a material data sheet on the intended biocide for Buyer approval.

2.2.5 Cleaning Requirements

All surfaces to be welded shall be free of paint, oil, grease, dirt and other foreign materials detrimental to the weld soundness. An area 4 inches wide minimum on each side of weld joint shall be cleaned. Acceptable cleaning methods shall be mechanical or chemical methods in accordance with ASTM A380.

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION, APPLICATION AND ERECTION

3.2.1 After welding all foreign materials such as flux, anti-spatter compound, slag and spatter shall be removed. Removal can be accomplished either by mechanical or chemical methods.

3.2.2 Heat tint (dark blue coloring) and scale shall be permitted on nonprocess side of weld joint. Light heat tint (straw or gold colored) shall be permitted on the process side of weld joint. When required, heat tint and scale can be removed either by mechanical or chemical descaling methods. For mechanical descaling, precleaning and postcleaning is required.

3.2.3 Liquid penetrant and ultrasonic examination materials shall be completely removed from surface after examination. Removal shall be in accordance both with manufacturer's recommendation and this specification section.

3.3 **FIELD QUALITY CONTROL**

(Not Used)

3.4 **ADJUSTMENTS**

(Not Used)

3.5 **CLEANING**

(Not Used)

3.6 **PROTECTION**

(Not Used)

3.7 **DEMONSTRATION**

(Not Used)

3.8 **SCHEDULES**

(Not Used)

END OF SECTION

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 13253
FABRICATION OF MELTER BUS BARS
B-595-P-P06A-13253

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3X 4__

ORIGINATOR:

R. Hulskamp, Mechanical Engineer Date

CHECKER:

D. A. Buzzelli, Lead Disc. Checker 12-18-92
Date

APPROVED BY:

C. J. Divona Lead Discipline Engineer

12-18-92
Date

SECTION 13253
FABRICATION OF MELTER BUS BARS
B-595-P-P06A-13253

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SECTION 13253
FABRICATION OF MELTER BUS BARS

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for fabrication, manufacture, assembly and inspection of melter bus bars.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Codes

ASME Section II, Part C	1989 Welding Rods, Electrodes and Filler Metals (Addenda 1990)
ASME Section V, Article 6	1989 Nondestructive Examination
ASME Section IX	1989 Welding and Brazing Qualification

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A	1988 Recommended Practice

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B568	1990 Standard Test Method for Measurement of Coating Thickness by X-ray Spectrometry
ASTM B571	1991 Standard Test Method for Adhesion of Metallic Coatings
ASTM B700	1990 Standard Specification for Electrodeposited Coatings of Silver for Engineering Use

1.3 **RELATED REQUIREMENTS**

Specification Section 13250	Fabrication of Melter and Frame Assembly
Specification Section 16610	Electrical Requirements for Package Equipment
Drawing H-2-120052	Melter Vessel/Frame Assembly
Drawing H-2-120238	Melter Bus Bars

1.4 **DEFINITIONS**

(Not Used)

1.5 **SYSTEM DESCRIPTION**

The melter bus bars transmit electrical power to the electrodes of the melter. The bus bars have been designed for a maximum of 3000 amperes and maximum 300 volts. Dimensional features were designed to fit within the melter and frame assembly so as to clear adjacent equipment and match the precise locations of the electrode terminals. For these reasons careful attention must be paid to achieve dimensional conformance of the bus bars in addition to the required soundness of fabrication.

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Shop details and location of any full penetration welds in accordance with Paragraph 2.2.1.1 shall be submitted for Buyer approval.

1.6.2 Silver plating procedure in accordance with Paragraph 2.2.1.2 shall be submitted for Buyer approval.

1.6.3 Welding Procedure Specifications and Procedure Qualification Records shall be submitted for approval prior to fabrication. These shall be prepared in accordance both with ASME Section IX and Paragraph 2.2.2.

1.6.4 Certified Material Test Reports (CMTRs) shall be submitted for Buyer review within 30 days after receipt from supplier. These shall include reports for weld filler materials.

1.6.5 Nondestructive examination (NDE) procedures for shop fabricated items shall be submitted for Buyer approval prior to fabrication.

1.6.6 Weld repair procedure shall be submitted for Buyer approval prior to fabrication.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

(Not Used)

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 General

2.2.1.1 The bus bars may be fabricated as one piece or in several segments joined together by optional full penetration welds. The shop details and locations of these welds shall be submitted for Buyer approval prior to fabrication.

2.2.1.2 The areas to be silver plated (refer to Drawing H-2-120238) shall be plated in accordance with ASTM B700. These areas shall be inspected for plating thickness and adhesion in accordance both with ASTM B568 and ASTM B571. Seller shall prepare a silver plating procedure in accordance with these requirements to be submitted for approval.

2.2.1.3 Each bus bar shall be encased with an insulation sleeve as outlined on Drawing H-2-120238. This shall be done after fabrication and silver plating are completed.

2.2.2 Welding

2.2.2.1 Weld procedures, welders, welding operators and tackers shall be qualified in accordance with ASME Section IX.

2.2.2.2 Weld filler metal shall be in accordance with ASME Section II, Part C. Filler metal ASME E/ER Cu shall be used for welding copper to copper or copper to silicon bronze.

2.2.2.3 Welding may be achieved by any one or combination of the following welding processes:

Welding Process	AWS Letter Designation
Gas Tungsten Arc Welding	GTAW
Gas Metal Arc Welding (Spray Transfer)	GMAW

2.2.2.4 All surfaces to be welded shall be free of paint, oil, dirt, scale and other foreign material detrimental to weld soundness.

2.2.2.5 An area minimum 1 inch wide on each side of the weld joint shall be ground to remove oxides and mill scale.

2.2.2.6 Flux, weld spatter and any slag shall be removed from each weld bead prior to depositing each succeeding pass.

2.2.2.7 Welding starts and stops shall be held to a minimum. Each such stop shall be properly conditioned before the weld is continued.

2.2.2.8 The preheat temperature shall be not less than 1000 °F.

2.2.2.9 Radiographic examination shall be performed on all full penetration welds. Examination procedures and techniques shall be in accordance with ASME Section V, Article 2.

The following indications shall be cause for rejection:

A. Any type of crack.

B. A single rounded indication greater than 1/16 inch.

C. Any group of indications in a cross-sectional plane in which the total area of voids exceeds 5% of the total cross-sectional area of the bus bar.

2.2.2.10 Where radiographic examination cannot be performed due to weld location, liquid penetrant examination (PT) shall be performed on each layer. PT shall be performed in accordance with ASME Section V, Article 6. Maximum defect size shall be 0.060 inches.

All fillet and partial penetration welds shall be examined by magnetic particle examination on the final layer.

2.2.2.11 Personnel performing nondestructive examination (NDE) shall be certified in accordance with ASNT SNT-TC-1A.

2.2.2.12 Any major repair of welds shall be in accordance with Buyer approved procedures.

PART 3 EXECUTION

(Not Used)

END OF SECTION

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 13254W
FABRICATION AND INSTALLATION OF MONOFRAX K3 REFRACTORY
B-595-P-P06A-13254W

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 12/18/92

WAPA YES X NO ___
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3 X 4__

ORIGINATOR:

A Russell 12/10/92
A. Russell, Mechanical Engineer Date

CHECKER:

Dale A. Buzzelli 12-18-92
D. A. Buzzelli, Lead Disc. Engineer Date

APPROVED BY:

C J Divona
C. J. Divona Lead Discipline Engineer

12-18-92
Date

SECTION 13254W
FABRICATION AND INSTALLATION OF MONOFRAX K3 REFRACTORY
B-595-P-P06A-13254W

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ATTACHMENTS

SECTION 13254W
FABRICATION AND INSTALLATION OF MONOFRAX K3 REFRACTORY

PART 1 GENERAL

1.1 SUMMARY

This specification section identifies the requirements for performance, fabrication, machining, testing, shipping, receipt, storage, and installation of Monofrax K3 refractory in a glass melter vessel. This melter vessel will be installed and operated in the Hanford Waste Vitrification Plant (HWVP) at the Hanford Site, Richland, Washington.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C20	1987 Standard Test Methods for Apparent Porosity, Water Absorption, Apparent Specific Gravity, and Bulk Density of Burned Refractory Brick and Shapes by Boiling Water
ASTM C134	1988 Standard Test Methods for Size and Bulk Density of Refractory Brick and Insulating Firebrick
ASTM C572	1981 Standard Methods for Chemical Analysis of Chrome-Containing Refractories and Chrome Ore
ASTM C573	1981 Standard Methods for Chemical Analysis of Fireclay and High-Alumina Refractories
ASTM D257	1991 Test Methods of D-C Resistance or Conductance of Insulating Materials
ASTM D3951	1990 Standard Practice for Commercial Packaging

1.3 **RELATED REQUIREMENTS**

Specification Section 13250	Fabrication of Melter and Frame Assembly
Specification Section 13251	Fabrication and Installation of Melter Refractory and Insulation

MONOFRAX K3 REFRACTORY DRAWINGS

Drawings as listed in Attachment A.

FIXTURES AND GAUGES DRAWINGS

Drawings as listed in Attachment B.

1.4 **DEFINITIONS**

(Not Used)

1.5 **SYSTEM DESCRIPTION**

This refractory will serve as the lining in a melter vessel designed to vitrify radioactive waste material.

The melter assembly consists of a water-cooled cylindrical shell with dished heads, a layer of insulation and refractory lining. Energy for the melt is provided by immersed plate electrodes with additional energy being supplied by eight resistance heaters above the melt line.

There are no provisions for repair or replacement of refractory or insulation. If the refractory or insulation fails, the entire melter must be removed from service.

The conducting glass cannot be permitted to migrate through the refractory and insulation to the shell. Therefore, all refractory and insulation joints must be held to the tolerances specified on the Contract Drawings.

Fabrication of the melter and frame assembly is described in Specification Section 13250. Fabrication and installation of other melter refractory and insulators is described in Specification Section 13251.

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Seller shall submit for Buyer review the following certified refractory test results:

A. Chemical analysis of each batch of Monofrax K3 refractory.

B. Bulk density of each Monofrax K3 refractory block.

C. Porosity of each Monofrax K3 refractory block.

D. Electrical resistivity of each Monofrax K3 refractory block.

1.6.2 Seller shall submit the following procedures for Buyer approval:

A. Procedures which detail methods and sequences for fabrication of refractory.

B. Methods for measuring block dimensions using the gauging fixtures.

C. An inspection procedure which details the verification of surface appearance and conformance to dimensional and joint tolerances.

D. A procedure detailing methods and materials used for matchmarking.

E. A packaging and shipping procedure which details methods of protecting refractory from damage during handling and transit.

F. An installation procedure which details the refractory installation sequence, methods of measurement and dimensional checks used to assure that the installation of refractory in the melter meet the dimensional requirements both of this specification section and Contract Drawings.

G. Procedures for welding, cleaning, painting, storing and shipping the forming and gauging fixtures.

H. Procedures and rationale for obtaining representative refractory samples for chemical analysis.

I. Procedures for control of samples for chemical analysis and blocks for density, porosity and electrical resistivity measurements. These procedures shall include (but not be limited to) methods for:

1) Sample identification and traceability.

2) Sample handling and transport.

3) Chain of Custody.

4) Instrument calibration.

5) Verifying accuracy of laboratory test methods such as use of blanks, spikes, etc.

6) Data handling and reporting.

1.6.3 Seller shall submit drawings of the fixtures and gauges referenced in Paragraph 2.2.1 for Buyer approval.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Seller shall provide all labor, engineering, materials, equipment and facilities to fabricate and install refractory as follows:

A. Fabricate, machine and grind refractory to meet the chemical, physical and dimensional requirements both of this specification section and those drawings listed in Attachment A.

B. Test and certify refractory material.

C. Provide special forming and gauging fixtures identified in Attachment B to fabricate and measure the refractory.

D. Install and matchmark refractory in gauging devices for verification of fitup.

E. Store refractory at Seller's facility until scheduled for installation in the melter vessel at the vessel fabricator's facility.

F. Package and ship refractory to the melter vessel fabricator's facility.

G. Supply sufficient mortar for installation of refractory.

H. Install all refractory at the melter vessel fabricator's facility to meet the dimensional and quality requirements of this specification section and the applicable drawings.

I. Provide labor and facilities to store, protect and ship the forming and gauging fixtures to Buyer.

2.1.2 Glass Contact Refractory

2.1.2.1 Physical Property and Performance Requirements

All glass contact blocks shall be Monofrax K3, a fused-cast chrome-alumina refractory. The blocks shall be fabricated using an EPIC-3 casting method. Blocks shall be rough cast with allowances for machining to the final dimensions and tolerances shown on the Contract Drawings.

A. Chemical composition shall meet the following weight percentage requirements as determined by methods identified in ASTM C572 and ASTM C573:

• Aluminum oxide (Al_2O_3)	55.0	minimum
• Chromium oxide (Cr_2O_3)	25.0	minimum
• Magnesium oxide (MgO)	4.9	minimum
• Silicon dioxide (SiO_2)	3.2	maximum
• Ferric oxide (Fe_2O_3)	7.4	maximum
• Sodium oxide (Na_2O)	0.45	maximum
• Other	1.0	maximum

B. The bulk density shall be 229 lbs/ft^3 minimum for blocks greater than 400 lbs and 222 lbs/ft^3 minimum for blocks less than 400 lbs as determined in accordance with ASTM C134.

C. The porosity shall not exceed 5 percent as determined in accordance with ASTM C20.

D. Electrical resistivity shall not be less than 200 ohm-centimeters at 1150°C.

2.1.2.2 Surface Appearance

The following tolerances for surface appearance are the maximum allowable per block:

A. Maximum depth of casting scars shall be one inch. This shall be determined by inserting a 1/4 inch diameter probe into the scar perpendicular to the sawed surface.

B. Area of coarse crystallinity shall not exceed 25 percent of a sawed surface.

C. One show-through annealing crack will be permitted. The width of the crack shall not exceed 1/32 inch. The length may not exceed 90 percent of any two opposite faces. The crack may not run more than 75 percent along an adjacent face.

D. One hot tear up to 3/32 inch is permitted provided it does not exceed 30 percent of the block contact face or 50 percent of an as-cast face.

E. Corner spalls up to 1-1/2 inch x 1-1/2 inch x 1-1/2 inch are permitted on the four corners which do not come in contact with the glass. Corner spalls are allowed on two glass contacting corners up to 1-1/2 inch x 1-1/2 inch x 1/2 inch deep. All corner spalls shall be measured from the point where the width on adjacent faces exceeds 1/4 inch.

All casting vugs shall be filled with Monofrax K air set cement after acceptable measurements of physical properties and surface appearance.

2.1.2.3 Setup In Gauging Fixture

Seller shall assemble the completed blocks in the gauging fixture described in Paragraph 2.2.1 to verify the assembly meets the tolerance requirements of the Contract Drawings. Seller shall matchmark the assembled refractory blocks such that they can be reassembled in the melter shell at a later date in the exact location and orientation.

Seller shall verify the gauging fixture meets the dimensional requirements of the drawings prior to assembling the blocks in the fixture.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Fixture and Gauges

Special fixtures are required to fabricate and measure the bottom and sidewall K3 refractory. These fixtures shall be fabricated by Seller and will be reused on future melters. These fixtures become the Buyer's property.

The fixture drawings are listed in Attachment B. They were prepared by Chicago Bridge and Iron (CBI) for the Defense Waste Processing Facility (DWPF) at the U.S. Department of Energy Savannah River Site.

Seller shall prepare fixture drawings based on the CBI drawings except that references to du Pont specifications, drawings, purchase order numbers, etc. will be replaced with appropriate Seller callouts. This shall include cleaning, painting and welding requirements.

2.2.2 Installation Requirements

2.2.2.1 Extreme care must be taken to prevent damage to the epoxy coating on the inside surfaces of the melter vessel and head. This coating serves as corrosion protection and is the final electrical isolation. Scribing of layout lines with a pointed tool is not permitted.

2.2.2.2 All pre-formed refractory shall be handled with care to avoid chipping or breaking. Any materials damaged by Seller shall be replaced at no charge to Buyer. Chipped or broken block shall not be used in this vessel unless prior written approval is obtained from Buyer.

2.2.2.3 Refractory shall be installed by refractory brick masons experienced in high temperature glass furnace construction. Qualified supervision familiar with all aspects of the job shall be on site at all times while work is in progress.

2.2.2.4 Refractory material shall be maintained at a temperature of 60°F to 95°F during installation.

2.2.2.5 Tools used in refractory installation shall be rubber or plastic coated or non-metallic to avoid chipping edges of blocks.

2.2.2.6 Where permitted, refractory may be cut with masonry saws with diamond blades only. No chipping or hammer cuts are permitted. No block less than half its original size shall be installed. No block shall be installed which is smaller on the back face than the exposed face.

2.2.3 Preparation for Shipping

Seller shall package the refractory. Packaging shall be subject to inspection by Buyer to ensure against damage during handling and transit. This protection shall include:

A. Sturdy wood crates which meet or exceed the minimum requirements of ASTM D3951.

B. Additional protection for corners and machined surfaces.

C. Use of pallets to permit forklift loading and unloading.

D. Provisions to minimize stresses on packed refractory and insulation.

E. Use of a dedicated truck with weather protection.

F. Seller shall package forming and gauging fixtures for storage and shipping subject to inspection by Buyer to ensure against damage.

G. Seller shall clean all fixtures of rust and debris.

H. Fixture machined surfaces shall be coated with a hard coating-type rust preventive such as Tectyl 890 (manufactured by Ashland Oil and Refining Co.) or equal.

I. The fixtures shall be packaged in sturdy wood crates.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

MONOFRAX K3 REFRACTORY

DRAWING NO.	SHT	OF	TITLE		
H-2-120242	1	18	ME-130-001	Melter Refractory/Insulation	Parts List
H-2-120242	2	18	ME-130-001	Melter Refractory/Insulation	Assembly
H-2-120242	3	18	ME-130-001	Melter Refractory/Insulation	Installation Dimensions
H-2-120242	8	18	ME-130-001	Melter Refractory/Insulation	K3 Refractory
H-2-120242	9	18	ME-130-001	Melter Refractory/Insulation	K3 Refractory

ATTACHMENT B

FIXTURES AND GAUGES

DRAWING NO.	SHT	REV	TITLE
44993	0-1	1	List of Drawings, References and General Notes
44993	12	4	Gauging Fixture Base, K3
44993	13	3	Template Supports, Jig and Removable Segment
44993	14	2	K3 Riser Gauge and Insert
44993	15	2	K3 Riser Support
44993	21	1	Trammel, Contour and Flatness Template Assemblies
44993	22	1	Template Support Arm, Contour and Flatness Template
44993	25	1	Zirmul and K3 Shaft Posts
44993	26	1	Zirmul and K3 Fixture Details
44993	28	0	Zirmul Fixture - Spanner Wrench and Nuts
44993	29	1	Locating Template
44993	PD1	5	Zirmul and K3 Fixture Details, Fixtures for Melter Vessel
44993	PD2	1	Zirmul and K3 Fixture Details, Fixtures for Melter Vessel
44993	PD3	1	Zirmul and K3 Fixture Details, Fixtures for Melter Vessel

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 14400
MELTER FRAME LIFTING YOKE FABRICATION
B-595-P-P06A-14400

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3 X 4__

ORIGINATOR:

C M Divona for
R. Hulskamp, Mechanical Engineer Date

CHECKER:

Dale A. Buzzelli 12-18-92
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

C M Divona
C. J. Divona Lead Discipline Engineer

12-15-92
Date

SECTION 14400
MELTER FRAME LIFTING YOKE FABRICATION
B-595-P-P06A-14400

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SECTION 14400
MELTER FRAME LIFTING YOKE FABRICATION

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for design, stress analysis, fabrication, manufacture, inspection, load test and testing of the melter frame lifting yoke.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A572/A572M	1991 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality
ASTM A578/A578M	1990 Standard Specification for Straight-Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Application
ASTM A668	1990 Standard Specification for Steel Forgings, Carbon and Alloy for General Industrial Use

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC M016	1989 Manual of Steel Construction - Allowable Stress Design, Ninth Edition

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B30.10	1987 Hooks
ANSI Y14.5M	1982 Dimensioning and Tolerancing

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	1986 Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1	1990 Structural Welding Code

FEDERAL STANDARDS (FED-STD)

FED-STD-595B	1989 Colors Used in Government Procurement

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-10	1989 Surface Preparation Specification No. 10 - Near White Blast Cleaning
SSPC PA-2	1989 Paint Application Specification No. 2 - Measurement of Dry Paint Thickness with Magnetic Gauges

1.3 **RELATED REQUIREMENTS**

Specification Section 05060	Welding Structural
Specification Section 13250	Fabrication of Melter and Frame Assembly
Drawing H-2-120239	Melter Vessel Lifting Yoke

1.4 **DEFINITIONS**

CG - Center of Gravity

1.5 **SYSTEM DESCRIPTION**

The melter frame lifting yoke, in conjunction with the canyon crane, is used to install or remove the melter frame assembly into or from its location in the melter cell. The yoke contains a single lifting lug which is engaged by the canyon crane hook above, and four shank hooks which are engaged with four lift lugs on the melter frame below.

The yoke's single lifting lug is offset with respect to the center of the yoke frame. This is due to the location of the melter frame assembly's center of gravity. The yoke shall be counterweighted so that it will be level as it is suspended from the canyon crane hook. This is to enhance ease of engagement of the four hooks with the lift lugs on the melter frame.

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 A design and stress analysis shall be submitted for Buyer approval prior to preparation of shop fabrication and manufacturing drawings. This analysis shall establish the following:

A. The location of the lifting lug on the yoke must coincide with the CG location of the Melter Frame Assembly as described in Specification Section 13250. This provides a level lift of the melter frame assembly.

B. A design layout of the structural frame, complete with sizes of structural members and sizes of weld joints. This layout shall be accompanied by a complete stress analysis.

The yoke shall be designed for a load factor of 150% of the rated load shown on H-2-120239. The calculated maximum static stresses shall not exceed 20% of the ultimate tensile strength of the material.

The stress analysis shall be in accordance both with AISC M016 and AWS D1.1.

The four hooks shall be designed in accordance with ANSI B30.10.

All interface control dimensions shown on Drawing H-2-120239 shall not be violated.

C. Dimensions, material, location and weld joint details for the counterweight. This is to provide a level lift of the yoke when it is empty.

It is anticipated that the addition of this counterweight will have an insignificant effect on the level lift established in accordance with Subparagraph A above. Seller is required to incorporate this counterweight in the analysis associated with Paragraph 1.6.1A.

1.6.2 Complete shop fabrication and manufacturing drawings shall be submitted for Buyer approval prior to fabrication. Shop drawings shall be prepared in accordance with the following practices:

A. Structural members described shall be in accordance with AISC M016.

B. Weld joint symbols shall be in accordance with AWS A2.4.

C. Dimensioning and tolerancing shall be in accordance with ANSI Y14.5M.

D. Bill of materials with complete material specifications shall be in accordance with Paragraphs 2.1.1 and 2.1.2. This shall include all supplementary requirements.

E. References by notes to applicable procedures for fabrication, welding, stress relief, nondestructive examination, load testing and painting.

1.6.3 Certified Material Test Reports (CMTR) for all materials and weld wire used in the yoke shall be submitted for Buyer review after receipt from the steel supplier.

In addition to the standard data required by the applicable material specifications, the CMTRs must include all supplementary certifications required in accordance with Paragraphs 2.1.1 and 2.1.2.

1.6.4 Welding and nondestructive examination (NDE) procedures shall be in accordance with Specification Section 05060.

1.6.5 A stress relief procedure shall be submitted for Buyer approval prior to fabrication. This procedure shall be prepared in accordance with Specification Section 05060.

1.6.6 A load testing procedure shall be submitted for Buyer approval prior to fabrication. This procedure shall be in accordance with the requirements of Paragraph 2.2.7.3.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 All structural shapes, gussets and stiffeners shall be in accordance with ASTM A572, Grades 42 and 50.

All plate material used for the upper lift lug shall be ultrasonically tested in accordance with ASTM A578, with Level I acceptance criteria and the following supplementary requirements:

S1 Continuous 100 % scanning
S3 Procedure submittal
S4 Operator's qualification

2.1.2 The four forged shank hooks and the hook pin in the lifting lug shall be in accordance with ASTM A668, Class K, with the following supplementary requirements:

S4 Carbon content for welding
S6 Magnetic particle inspection
S7 Ultrasonic testing

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 Fabrication of the yoke shall be in accordance both with the requirements of Specification Section 05060 and the Buyer-approved shop fabrication and manufacturing drawings.

2.2.1.1 The rolling direction of plates and shapes shall be oriented in a direction parallel to the direction of principal tensile stresses.

2.2.1.2 Structural members, gussets and stiffeners shall fit-up snugly. No ratholes shall be allowed.

2.2.2 The shank hooks shall be manufactured, nondestructively examined and load-tested in accordance with ANSI B30.10 prior to welding.

2.2.3 Weld joint and welder qualifications, welding and NDE shall be in accordance both with the requirements of Specification Section 05060 and the following:

2.2.3.1 All principal stress-carrying joints shall be full penetration welds. These welds shall be examined by either of the following methods:

A. Ultrasonic testing.

B. Radiographic examination.

C. Progressive magnetic particle examination on each layer.

2.2.3.2 All fillet and partial penetration welds shall be examined by progressive magnetic particle examination on each layer.

2.2.3.3 The acceptance criteria for NDE shall be in accordance with Specification Section 05060.

2.2.4 The yoke shall be stress-relieved in accordance with Specification Section 05060. This shall be performed after completion of all welding and prior to load testing.

All welds shall be re-inspected by magnetic particle examination following stress relief operations.

2.2.5 The yoke shall be subjected to a dimensional inspection after stress relief to verify positional and elevational requirements of the four hooks. If straightening of the shank hooks and/or the structural frame is needed to correct out-of-tolerance conditions this shall be done without the application of heat.

2.2.6 The yoke shall be equipped with a stainless steel identification plate. The plate shall be engraved with the following information:

Manufacturer's name or logo.
Buyer P.O. number.
HWVP equipment number.
Rated capacity.

The plate shall be seal-welded to the yoke frame.

2.2.7 Inspection and Testing

2.2.7.1 Tolerance requirements for all dimensional characteristics shown on the Buyer-approved shop drawings shall be inspected for conformance. This shall include those requirements implied by the weld joint symbols.

2.2.7.2 The yoke shall be functionally tested for two separate operating conditions as follows:

A. The unloaded yoke shall be level within 2 degrees when suspended from an overhead crane that is outfitted with a 117-ton hook.

This test may be performed in conjunction with the test fixture described in Paragraph 2.2.7.2B. In this case the acceptable criteria shall be that the four hooks can be made to engage freely with the four lift lugs on the test fixture.

B. A test fixture, described below, shall be level within 2 degrees when suspended from an overhead crane via the yoke.

Seller shall design and fabricate a test fixture which resembles the melter frame assembly in terms of total weight, CG location and lifting lugs as described in Specification Section 13250.

2.2.7.3 The yoke shall be proof load-tested to 127.5 +1/-0 tons (150% of rated capacity) for a period of not less than 10 minutes.

This test may be performed using the fixture described in Paragraph 2.2.7.2B. In this instance, the fixture shall be weighted to over 127.5 tons (or anchored). The pull force shall be applied via a load-indicating device.

All welds shall be re-inspected by magnetic particle examination in accordance with Paragraph 2.2.4 after the load test is completed.

2.2.8 Surface Preparation and Painting

The surfaces of the yoke shall be cleaned and painted in accordance with SSPC SP-10 and the paint manufacturer's recommended methods, respectively.

The primer coat shall be an inorganic zinc-rich primer, Ameron Dimetcote 9 or equal, with a total dry film thickness of 2.5 +/-.5 mils that has a minimum of 6 grams of zinc per square foot of dried film.

The finish coat shall be a high-build polyamide epoxy paint, Amercoat 66 or equal, two coats, with a total dry film thickness of 10 +/- .5 mils.

The total thickness of primer and finish coats shall be 12.5 +/- 1.0 mils.

The following paint colors and color numbers are in accordance with FED-STD-595B and are applicable to the Melter Frame Lifting Yoke as follows:

A. The yoke frame shall be Gray #16492.

B. The hooks shall be Red #21105.

C. The lifting eye shall be Yellow #13655.

D. The yoke number and capacity (see Drawing H-2-120239) shall be Yellow #13655 in 3 inch high characters.

E. The "NORTH" arrow and text (see Drawing H-2-120239) shall be Yellow #13655.

The dry film thickness shall be inspected with a magnetic thickness gauge (Nordson "Mikrotest" or equal) in accordance with SSPC PA-2.

PART 3 EXECUTION

(Not Used)

END OF SECTION

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 16120
SOLDERING - ELECTRICAL
B-595-P-P06A-16120

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3 X 4__

ORIGINATOR:

A. Estrada, Welding Engineer 12/18/92 Date

CHECKER:

D. A. Buzzelli, Lead Disc. Checker 12-18-92 Date

APPROVED BY:

C. J. Divona Lead Discipline Engineer 12-18-92 Date

SECTION 16120
SOLDERING - ELECTRICAL
B-595-P-P06A-16120

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SECTION 16120
SOLDERING - ELECTRICAL

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the cleaning, soldering, examination and testing requirements for the electrical pin connectors.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B32 1989 Standard Specification for Solder Metal

MILITARY SPECIFICATION

MIL-T-13513B(AT) 1989 Terminals, Lugs and Splices, Conductor

1.3 RELATED REQUIREMENTS

(Not Used)

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Cleaning procedures shall be submitted for Buyer approval. These shall include precleaning and final cleaning of solder connections.

1.6.2 Soldering procedures shall be submitted for Buyer approval. A procedure shall be submitted for each type and size of electrical pin. Submittals shall include essential variables that are critical for a sound solder connection (i.e., soldering power

source, solder type, flux type, soldering technique, nondestructive examination and mechanical testing).

1.6.3 Seller shall submit for Buyer approval all nondestructive examination and mechanical testing procedures that will be used during production. The procedure shall indicate sample test size and frequency of testing.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Acceptable soldering materials shall be Sn60 solder and RMA rosin flux. Solder material shall be in accordance with ASTM B32.

2.1.2 Solder and flux used in production soldering shall be the same brand solder and flux referenced in submitted soldering procedure.

2.1.3 Acceptable cleaning fluids used to remove flux on electrical connectors shall be as follows:

Mild soap and water
Mineral spirits
White kerosene
VM & P Naphtha
Heptane
Hexane
Methyl isopropyl alcohol
Methyl isobutyl alcohol
Petroleum ether
Formula 409 (Registered Trademark of the Clorox Company)
Joy (Registered Trademark of Proctor & Gamble)
Top Job (Registered Trademark of Proctor & Gamble)
Palmolive Liquid (Registered Trademark of Colgate Palmolive Company)
Windex with Ammonia D (Registered Trademark of the Drackett Products Company)

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 The pin connector to which electrical wiring is being attached shall be disconnected from both the pin and insulating plate during the soldering.

2.2.2 Each soldering technician shall be assigned a symbol or number to identify his/her work. A record log may be kept in lieu of assigned symbols or numbers. Each soldered pin connector shall be traceable to a qualified technician.

2.2.3 Procedure Qualification

2.2.3.1 Seller shall develop a soldering procedure. The same type and size of electrical pins, pin connectors, power source, solder, flux and soldering technique used in production soldering shall be used to develop said procedure.

2.2.3.2 Five test specimens shall be soldered for each procedure. The specimens shall be tested in accordance with Paragraphs 3.2.1 and 3.2.2. The procedure is qualified once all five specimens pass tests.

2.2.3.3 Once production soldering is begun, any changes to the procedure shall require complete requalification.

2.2.4 Soldering Technician Certification

2.2.4.1 Soldering technicians shall be certified in accordance with approved soldering procedure. Technicians shall be certified for each type and size of electrical connector.

2.2.4.2 Personnel certification shall include nondestructive examination and mechanical testing. During certification, mechanical testing of soldered connections shall be conducted until the technician can produce two consecutive electrical connections that do not contain any defects. Nondestructive examination shall be in accordance with Paragraph 3.2.1. Mechanical testing shall be in accordance with Paragraph 3.2.2.

2.2.4.3 A record of technician certification shall be made available upon Buyer request.

2.2.4.4 Any technician shall be tested and recertified when the work of the said technician creates a reasonable doubt as to the quality of his/her workmanship.

2.2.4.5 Technicians shall be recertified if any essential variables are changed in the soldering procedure.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 All dirt, oil, grease and contaminants detrimental to sound solder connection shall be removed from solder surface prior to soldering. Acceptable cleaning methods are hot solvent degreasing, cold liquid solvent immersion and hot alkali detergent degreasing. For alkali detergent method the connectors shall be steam or water-washed to remove all cleaning solution. Soft water is preferable to eliminate hard water deposit.

3.2 INSTALLATION, APPLICATION AND ERECTION

3.2.1 Nondestructive Examination

3.2.1.1 All soldered electrical connections shall be visually inspected.

3.2.1.2 An acceptable connection will have a shiny solder finish and display excellent wetting. Solder shall be wicked up the wire strand.

3.2.1.3 Unacceptable soldered connections will have the following characteristics:

A. Dull solder finish (indicating a cold joint).

B. Overheated or granular-looking joint.

C. Pitted or porous joint.

D. Rosin solder joints caused by rosin being trapped between the wire and connector.

E. Contaminants in the solder.

F. Fractured-looking joint.

G. Insufficient solder in the joint.

3.2.2 Mechanical Testing

3.2.2.1 Mechanical testing of soldered electrical connections shall be implemented during soldering procedure qualification and technician certification.

3.2.2.2 Mechanical testing shall include:

A. Sectioning the soldered electrical connection to ensure the solder is wicking up the wire strand, solder is wetted to the wire strand and electrical pin connector and no voids exist.

B. Tensile testing to ensure the strength of solder connection. The soldered electrical connection shall withstand the minimum mechanical load as specified in Table 1. Tensile testing to destruction is not required. Acceptable tensile testing machine shall be an Instron or equal.

TABLE 1. MINIMUM MECHANICAL STRENGTH REQUIREMENTS (VALUES IN ACCORDANCE WITH MIL-T-13513B(AT)

CABLE SIZE (AWG)	MINIMUM STRENGTH (POUNDS)	CABLE SIZE (AWG)	MINIMUM STRENGTH (POUNDS)
20	19	6	270
18	28	4	350
16	37	2	555
14	45	1	650
12	95	0	760
10	150	00	860
8	195	0000	1000

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 16610
ELECTRICAL REQUIREMENTS FOR PACKAGED EQUIPMENT
B-595-P-P06A-16610

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 9/22/92

WAPA YES ___ NO X
QUALITY LEVEL I X II ___
SAFETY CLASS 1__ 2__ 3X 4__

ORIGINATOR:

FOR A. LARSEN 12/17/92
A. Larsen, Electrical Engineer Date

CHECKER:

Abe Talebi 12-17-92
Abe Talebi, Electrical Engineer Date

APPROVED BY:

K. A. Owrey
K. A. Owrey Lead Discipline Engineer

12-17-92
Date

SECTION 16610
ELECTRICAL REQUIREMENTS FOR PACKAGED EQUIPMENT
B-595-P-P06A-16610

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SECTION 16610
ELECTRICAL REQUIREMENTS FOR PACKAGED EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

This specification covers the general requirements for the design, fabrication, testing and inspection of the electrical equipment, materials and devices furnished as part of the melter and frame assembly.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI MC96.1	1982 Temperature Measurement Thermocouples

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A167	1990 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
ASTM A193/A193M	1991 Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A194/A194M	1991 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A268	1991 Standard Specification for Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service
ASTM 276	1990 Standard Specification for Stainless and Heat-Resistant Steel Bars and Sheets
ASTM A312/A312M	1991 Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A403/A403M	1991 Standard Specification for Wrought Austenitic Stainless Steel Pipe Fittings

ASTM A743	1991 Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
ASTM B355	1990 Standard Specification for Nickel-Coated Soft or Annealed Copper Wire

MILITARY SPECIFICATION

MIL-W-81381A	1976 Wire, Electric, Polyimide-Insulated Copper or Copper Alloy

NATIONAL ELECTRIC MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	1985 Enclosures for Electrical Equipment (1000 Volts Maximum) Revision 2 - 1988

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	1990 National Electrical Code (NEC)

UNDERWRITERS LABORATORIES, INC. (UL)

UL 50	1990 Cabinets and Boxes
UL 486A	1989 Wire Connectors and Soldering Lugs for Use with Copper Conductors

WESTINGHOUSE DRAWINGS

Drawing Number H-2-83399	Assembly Upper Electrical Equipment Connector
Drawing Number H-2-83400	Upper Electrical Connector Components (Floating Pins)
Drawing Number H-2-83401	Lower Electrical Connector Components (Floating Pins)
Drawing Number H-2-83402 (Sheets 1, 2 and 3)	Electrical Equipment Connector Parts

1.3 **RELATED REQUIREMENTS**

Specification Section 05060	Welding Structural
Specification Section 01730	Operation and Maintenance Data
Specification Section 16120	Soldering-Electrical
Specification Section 13250	Fabrication of Melter and Frame Assembly

1.4 **DEFINITIONS**

(Not Used)

1.5 **SYSTEM DESCRIPTIONS**

All electrical materials and devices, as specified in this section, shall be supplied by the Seller, with the exception of the electrical connector assembly housings. These shall be supplied by the Buyer. For a complete description of the Melter and Associated Equipment, see Specification Section 13250.

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract, unless otherwise noted, for Buyer's review and approval.

1.6.1 Dimensional outline drawings for Buyer's review showing the location of all major electrical equipment, including pull boxes, with all the applicable device ratings. Conduit routing and connections to the lower electrical connectors shall be shown.

1.6.2 Detailed bills of material for Buyer's review including name of the manufacturer and catalog number of all electrical components.

1.6.3 Certified factory test reports for Buyer's review in accordance with Paragraph 2.2.2.

1.6.4 Manufacturer's installation instructions for Buyer's review.

1.6.5 Test procedures for Buyer's approval prior to testing for all tests specified in this specification section.

1.6.6 Manufacturer's procedures for field testing for Buyer's review.

1.6.7 Assembly procedures for Buyer's approval of the electrical connector assemblies. As a minimum, procedures shall be in accordance with Westinghouse drawings H-2-83399, H-2-83400, H-2-83401, H-2-83402 and shall include the following:

1.6.7.1 Wire preparation-Stripping, Cutting and Cleaning;

1.6.7.2 After Solder Cleaning;

1.6.7.3 Heat Shrink Tubing Installation;

1.6.7.4 Pin, Socket and Connector Assembly;

1.6.7.5 Continuity Testing; and

1.6.7.6 Quality control hold and check points.

1.6.8 Electrical operation and maintenance data in accordance with Specification Section 01730, Operation and Maintenance Data.

1.7 **CLASSIFICATIONS OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A.	Site Elevation	714 feet above sea level
B.	Barometric Pressure	14.3 psia

1.8.2 Operating Environment

A.	Normal Temperature	60°F to 104°F
B.	Maximum Temperature	104°F
C.	Relative Humidity	Not Controlled

1.8.3 Equipment located outside of the vessel but inside the melter vessel assembly will be subject to a maximum unshielded integrated dose of 3×10^{8} rads during the 5-year life span of the melter assembly.

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 General

2.1.1.1 When applicable, all electrical materials and equipment shall be listed by Underwriters Laboratories and shall bear the UL label.

2.1.1.2 When two or more components of the same specifications are required, the components shall be identical having the same manufacturer and catalog number.

2.1.2 Conduit

2.1.2.1 Austenitic stainless steel conduit shall be Type 304L Schedule 40 in accordance with ASTM A312/A312M.

2.1.2.2 Magnetic stainless steel conduit shall be Type 446 Schedule 40 in accordance with ASTM A268.

2.1.3 Pull Boxes

2.1.3.1 Pull boxes shall be NEMA 4X with peroxide cured EPDM gaskets in accordance with NEMA 250 and UL 50 and sized in accordance with the National Electrical Code. Boxes and box covers shall be fabricated from Type 304L stainless steel in accordance with ASTM A167.

2.1.4 Conduit Fittings

2.1.4.1 Weld fittings for stainless steel conduit shall be in accordance with ASTM A403/A403M.

2.1.4.2 Corrosion resistant cast fittings shall be in accordance with ASTM A743.

2.1.5 Miscellaneous Hardware

2.1.5.1 All conduit straps, conduit clamps and all hardware such as screws, bolts and nuts, shall be nonmagnetic Type 304 or 316 stainless steel in accordance with ASTM A193/A193M or ASTM A194/A194M.

2.1.5.2 Conduit support channel shall be stainless steel Type 304L in accordance with ASTM 276.

2.1.6 Cable

2.1.6.1 General Requirements

2.1.6.1.1 Cable supplied shall be new, shall be the product of an established manufacturer normally engaged in the production of cable with a minimum of 5 years documented experience, and shall be that manufacturer's newest product.

2.1.6.1.2 Cable shall be continuous. Factory splices or factory repairs are not acceptable in individual conductors. Cable shall be free of abrasions.

2.1.6.2 600 Volt Power Cable

2.1.6.2.1 Cables herein specified shall be single conductor, 600 volts, 200°C in accordance with the Military Specification MIL-W-81381A and Specification Sheet MIL-W-81381/12C.

2.1.6.2.2 Conductor

A. Conductor shall be nickel coated, annealed copper in accordance with ASTM B355. Stranding shall be in accordance with Table II of Specification MIL-W-81381A.

2.1.6.2.3 Insulation

A. The insulation for #2 AWG cable and smaller shall be 200°C Kapton Polyimide or equal in accordance with MIL-W-81381/12C. Insulation for the 1/0 cable shall be the same as for the #2 AWG cable as specified in MIL-W-81381/12C.

2.1.6.3 Thermocouple Cable

2.1.6.3.1 The following cable types refer to cable designations in Contract Drawings.

2.1.6.3.2 Thermocouple Extension Wire Type DB

A. Conductors shall be 16 AWG twisted stranded copper/copper (Type BX) and in accordance with ANSI MC96.1. Drain wire shall be 7-strand uninsulated tinned copper, 18 AWG minimum.

B. Primary insulation shall be 300 volt, 260°C rated fused Kapton tape or equal.

C. Cable shield shall be polyester backed aluminum tape. Drain wire shall be installed in continuous contact with aluminum shield.

D. Overall jacket shall be two layers of fused Kapton tape with a 50 percent minimum overlap. Tape thickness shall be 7 mils.

E. Cable jacket shall be grey and shall contain one grey and one red conductor.

2.1.6.3.3 Thermocouple Extension Wire Type DK

A. Conductors shall be 16 AWG twisted stranded alloy chromel/ alumel (Type KX) in accordance with ANSI MC96.1. Drain wire shall be 7-strand uninsulated tinned copper, 18 AWG minimum.

B. Primary insulation shall be 300 volt, 260°C rated fused Kapton tape or equal.

C. Cable shield shall be polyester backed aluminum tape. Drain wire shall be installed in continuous contact with aluminum shield.

D. Overall jacket shall be two layers of fused Kapton tape or equal with a 50 percent minimum overlap. Tape thickness shall be 7 mils.

E. Cable jacket shall be yellow and shall contain one yellow positive, and one red, negative conductor.

2.1.7 Heat Shrink Tubing

2.1.7.1 Heat shrink tubing shall be rated for 1000 volts, radiation-resistant and flame retardant. Raychem WCSF-N or equal.

2.1.8 Adhesive Tape

2.1.8.1 Adhesive tape for insulation shall be rated for 1000 volts and shall be radiation-resistant. Raychem S1119 or equal.

2.1.8.2 Color coding tape shall be 1/2" thick vinyl plastic type. Plymouth 3165 or equal.

2.1.9 Terminals

2.1.9.1 Terminals for 10 AWG or smaller shall be non-insulated ring, crimp type and in accordance with UL486A. Thomas and Betts B14 series and C10 series or equal.

2.1.9.2 Terminals for 8 AWG or larger shall be long barrel crimp type. Thomas and Betts 54900BE series or equal.

2.1.10 Cord Connectors

Cord connectors shall be stainless steel. Hubbell SHC-SS or equal.

2.1.11 T-Connectors

T-connectors for heater tube to cable shall be Burndy NSNT or equal.

2.1.12 Three-Conductor Lug

Three-conductor lugs shall be Burndy K2A26U-2N or equal.

2.1.13 Identification

2.1.13.1 Wire and Cable

2.1.13.1.1 Identification of thermocouple and power circuits shall be by means of heat shrinkable, insulated tubing with circuit number identification by printed characters on a white heat shrink sleeve; Raychem NTMS or equal.

2.1.14 Grounding Conductors

2.1.14.1 The electrical equipment ground conductors shall be 600 volt power cable as defined in this specification section.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 Assembly

2.2.1.1 Electrical installation shall be in accordance with NFPA 70.

2.2.1.2 Conduit

2.2.1.2.1 Pull boxes shall be supported independently of the conduit system.

2.2.1.2.2 All conduit connections, including connections at pull boxes, shall be welded. Conduits shall be joined using fittings. Fittings shall be seal welded in accordance with Specification Section 05060.

2.2.1.2.3 Before making up conduit runs, the interiors of all conduit, conduit bends, and fittings shall be free of all burrs and sharp edges, dirt, cuttings, and other foreign material.

2.2.1.2.4 Minimum conduit size shall be 3/4 inch.

2.2.1.2.5 Conduit for power circuits shall be austenitic stainless steel. Conduit for thermocouple circuits shall be magnetic stainless steel.

2.2.1.2.6 Conduit runs shall terminate as close to their respective loads as possible. Heat shrink tubing shall be used at conduit ends to provide mechanical protection to exiting cables.

2.2.1.2.7 Mount electrical conduit as far from electrode bus bars as possible. As a minimum the following separation shall be achieved:

	Parallel (Feet)	Perpendicular (Feet)
Bus Bar - Thermocouple	2	1
Power/Control - Thermocouple	1	1/2

2.2.1.3 Cable

2.2.1.3.1 Wire and cable shall not be pulled until the raceway system is complete from pull point to pull point.

2.2.1.3.2 Care shall be exercised while installing wire in conduits so as not to damage the conductor insulation.

2.2.1.3.3 Cable as it is pulled, shall be visually inspected by the Seller. Cables with abrasions, or lumps shall not be used.

2.2.1.3.4 Cables shall be pulled into conduits in such a manner as to avoid sharply bending or kinking conductor, damaging or stressing insulation. Minimum cable bending radius shall not be smaller than that specified by the manufacturer.

2.2.1.3.5 Wire sizes shall be as shown on the Contract Drawings.

2.2.1.3.6 Cable terminations shall be made in accordance with the Contract Drawings.

2.2.1.3.7 Cable partially installed for future connection to loads by others shall be bundled and protected for shipment.

2.2.1.3.8 All power wiring shall be continuous from terminal to terminal without splices. Thermocouple extension wire shall consist of a continuous length with splicing in accordance with the Contract Drawings and only at the thermocouple and extension wire transition.

2.2.1.4 Pull boxes shall be used instead of fittings. Pull box covers shall be attached with screws.

2.2.1.5 Identification

2.2.1.5.1 Conductors shall be identified at each end and in pull boxes with heat shrinkable tubing. Identification inscription shall be by individual and distinctive numbers for each conductor as indicated on the Contract Drawings.

2.2.1.5.2 Conduits

Conduits shall be identified on both ends with identification numbers as shown on the Contract Drawings. One inch numbers shall be permanently stencilled on conduit.

2.2.1.5.3 Pull Boxes

Identification number, where indicated on the Contract Drawings, shall be permanently stencilled on the box cover and box side. Height of numbers shall be one inch.

2.2.1.6 Soldering

Soldering shall be in accordance with specification Section 16120.

2.2.1.7 Cable Marking

The surface of the insulation shall have a durable marking, at intervals not exceeding 24 inches, which shall consist of: manufacturer's name, number and size of conductors, voltage rating, cable type(s) and temperature rating.

2.2.1.8 Cable Color Coding

2.2.1.8.1 Conductors for 480 volt, three phase systems shall be color coded as follows: Phase A (brown), Phase B (orange), Phase C (yellow), grounding conductor (green). Color coding shall be either by pigmented insulation or by application of colored adhesive tape.

2.2.1.8.2 Conductors for voltages less than 120 volts AC shall be black.

2.2.2 Testing

2.2.2.1 General

2.2.2.1.1 Furnish all materials and test equipment required to perform tests, checks, inspections and the Factory Acceptance Tests in accordance with this specification section. Seller has the option of using equipment in his possession with valid National Bureau of Standards Certification of equipment or can use the service of a testing lab with valid National Bureau of Standards Certification of equipment.

2.2.2.1.2 The calibrating and testing equipment used for tests, checks, inspections and Factory Acceptance Test shall be calibrated within six months prior to testing. Seller shall provide proof of calibration.

2.2.2.1.3 Equipment failing the standards test shall not be used until repaired and re-standardized. All calibrating and testing equipment shall have valid certified label affixed to the equipment during usage. The label shall be affixed in a prominent location. The Buyer can, at his discretion, require the calibrating and testing equipment to be checked to the standards. Standards must not be used as calibration and testing devices in the field.

2.2.2.1.4 Seller shall be responsible for ensuring that the accuracy of the testing equipment is equal to (or better) than the accuracy of the equipment to be calibrated/tested.

2.2.2.1.5 Buyer may want to witness functional test. The Seller shall notify the Buyer 10 days prior to test, advising him of the test to be performed, and the scheduled date and time of test.

2.2.2.2 Wire and Cable Tests

2.2.2.2.1 Continuity Test

A. Test for continuity and correctness of wiring and verify correct identification on all conductors installed.

B. Test shall be made with an ohmmeter.

2.2.2.2.2 Insulation Resistance Test

A. All conductors shall be given an insulation resistance test using a megohmmeter.

B. Tests for each circuit shall be made between one conductor and ground with the other conductors grounded. Each conductor shall be tested in the same manner. The voltage shall be applied and readings taken every minute until three equal and consecutive readings are obtained.

C. Test voltages and minimum acceptable insulation resistance shall be as follows:

Insulation Voltage	Test Voltage	Min. Insulation Resistance
300 volt ac	500 Vdc	10 megohms
600 volt ac	1000 Vdc	10 megohms

2.2.2.3 Bus Bar Insulation Resistance Test

2.2.2.3.1 Bus Bar shall be given an insulation resistance test using a megohmmeter.

2.2.2.3.2 Test voltage and minimum acceptable insulation resistance shall be as follows:

Insulation Voltage	Test Voltage	Min. Insulation Resistance
600 Vac	1000 Vdc	10 megohms

PART 3 EXECUTION

(Not Used)

END OF SECTION

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 17915
THERMOCOUPLE FURNISHED WITH MELTER
B-595-P-P06A-17915

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 12/18/92

WAPA YES ___ NO X
QUALITY LEVEL I ___ II X
SAFETY CLASS 1__ 2__ 3 X 4__

ORIGINATOR:

Robert J. Lewis 12-18-92
R. J. Lewis, Ctrl. Sys. Engr. Date

CHECKER:

B R Carlisle 12-18-92
B. R. Carlisle, Ctrl. Sys. Engr. Date

APPROVED BY:

B R Carlisle FOR
J. B. Bunning Lead Discipline Engineer

12-18-92
Date

SECTION 17915
THERMOCOUPLE FURNISHED WITH MELTER
B-595-P-P06A-17915

TABLE OF CONTENTS

SECTION 17915
THERMOCOUPLE FURNISHED WITH MELTER

PART 1 GENERAL

1.1 SUMMARY

This section defines the requirements for the supply, inspection and testing of the thermocouple furnished with Melter ME-130-001 specified in Specification Section 13250.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI-MC96.1	1982 Temperature Measurement Thermocouples (Revision of ANSI-MC96.1 - 1975)

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA-S20	1981 Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

1.3 RELATED REQUIREMENTS

Specification Section 01730	Operation and Maintenance Data
Specification Section 13250	Fabrication and Melter Frame Assembly

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEMS DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract:

Use only the following drawing sizes:

A 8-1/2 inches by 11 inches
B 11 inches by 17 inches
D 28 inches by 40 inches

1.6.1 Catalog cuts describing the thermocouple.

1.6.2 Manufacturer's certified dimensional outline and installation drawings.

1.6.3 Manufacturer's operation and maintenance manuals in accordance with Specification Section 01730.

1.6.4 Instrument data sheet similar to ISA S20, completed in accordance with ISA S20 instructions.

1.6.5 Drawing showing location and identification of terminals, conduit sizes, and entrance locations.

1.6.6 Document showing tag number, service, manufacturer, model number, and range.

1.6.7 Factory Acceptance Test procedure (FAT) including requirements in Paragraph 2.3.1.

1.6.8 Report confirming the FAT procedure was executed and the results.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A.	Site Elevation	714 feet above sea level
B.	Barometric Pressure	14.3 psia

1.8.2 Operating Environment

A.	Normal Temperature	60°F to 104°F
B.	Maximum Temperature	104°F

1.8.3 Radiation

Equipment located outside of the vessel but inside the Melter Vessel Assembly is subject to a maximum unshielded total integrated dose of 3×10^8 Rads.

1.9 **UTILITIES**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Provide a thermocouple (TE-130-584) Thermo Electric Model No. B18U-P10R-W-5-LSP-9.5-12-19A, LSP=convex bend radius 22.5 inches or equal. Include the following features:

A. Fabrication in accordance with ANSI MC96.1.

B. B type, ungrounded, platinum 10 percent rhodium sheath, MgO insulated, measuring temperature between 1300°F and 1500°F.

C. Weld pad, 1/2 inch x 1/2 inch x 1/8 inch, longitudinal convex bend radius 22.5 inches.

D. Total length from tip of weld pad to end of transition junction 11.625 inches ± 1/16 inch, diameter of 1/8 inch ±.002 inch.

E. Transition junction of Inconel 600 with transition O.D. less than or equal to sheath O.D.

F. Lead wires, 12 inches minimum, with CEFIR insulation and CEFIR overall.

G. Positive wire color coded grey and negative wire color coded red.

H. Packing gland, Conax EG-125-A-XX-L or equal to be attached during installation. Thermocouple must seal in packing gland specified.

2.1.2 Labeling

Stamp or engrave instrument tag number on transition junction.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 Instrument Mounting

Mount and support instruments in accordance with manufacturer's installation documents and Contract Drawings.

2.3 FACTORY ACCEPTANCE TEST (FAT)

2.3.1 Prepare a FAT procedure and submit it for approval. Include inspection/tests in accordance with ANSI MC96.1 to demonstrate that the fabrication and assembly of the materials meet the requirements of the specification.

2.3.2 Inspect and test the thermocouple according to the Buyer approved FAT procedure.

2.3.3 Submit a test report confirming that the FAT procedure has been completed and the results.

2.4 PACKAGING AND SHIPPING

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

QUALITY LEVEL 1
SAFETY CLASS 3

DEC 23 1992

REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS
0	12/18/92	APPROVED FOR CONSTRUCTION	QE AC CP

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ENGINEERING RELEASE
REV _____ DATE _____
ERO _____

SIGNATURE	DATE
PROJ DIR	
QA MGR	
INDEPENDENT SAFETY MGR	
PROJECT MGR	
SYSTEMS MGR	
ENGINEERING MGR	
SUPERVISOR C D Dixon	12/18/92
DESIGN ENGINEER R W Shaw	12/18/92
CHECKED J Weichbrand	12/18/92
DRAWN L.C.SANVICTORES	2-03-92

U.S. DEPARTMENT OF ENERGY
Richland Field Office
DE - AC06-86RL10838

FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

ME-130-001
MELTER
ARGON FEEDING TUBE
ASSEMBLY

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P06A
SCALE: 1/4	BLDG NO.: 1	INDEX NO.:

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
NONE	NOT REQD	H-2-120249	1	5	0

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INITIALS: PN
DATE: 12-16-92

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SAFETY CLASS 3

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0	12/18/92	APPROVED FOR CONSTRUCTION	JL AC GP

CADFILE: B120249B | CADCODE: 2B:IBM:ACD2:10.C2:SS

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REV _____ DATE _____
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SIGNATURE	DATE
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QA MGR	
INDEPENDENT SAFETY MGR	
PROJECT MGR	
SYSTEMS MGR	
ENGINEERING MGR	
SUPERVISOR	12/16/92
DESIGN ENGINEER	12/17/92
CHECKED	12/18/92
DRAWN L.C.SANVICTORES	2-11-92

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FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

ME-130-001
MELTER
ARGON FEEDING TUBE
T/C SUPPORT BRACKET

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P06A
SCALE	BLDG NO.	INDEX NO.
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M101 ACAD

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SAFETY CLASS 3

DEC 23 1992

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CADFILE: B120249C | CADCODE: 2B:IBM:ACD2:10.C2:SS

ENGINEERING RELEASE
REV _____ DATE _____
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SIGNATURE	DATE
PROJ DIR	
QA MGR	
INDEPENDENT SAFETY MGR	
PROJECT MGR	
SYSTEMS MGR	
ENGINEERING MGR	
SUPERVISOR C.W. Wilson	12/17/92
DESIGN ENGINEER C. Thielen	12/18/92
CHECKED J. Verbrugge	12/18/92
DRAWN L.C.SANVICTORES	2-13-92

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FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

ME-130-001
MELTER
ARGON FEEDING TUBE
PACKING ASSEMBLY

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P06A
SCALE: 1/1	BLDG NO.: 1	INDEX NO.:

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QUALITY LEVEL 1
SAFETY CLASS 3

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REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS
0	12/18/92	APPROVED FOR CONSTRUCTION	QL AC GW

CADFILE B120249D CADCODE 2B:IBM:ACD2:10.C2:SS

ENGINEERING RELEASE
REV _____ DATE _____
ERO _____

SIGNATURE	DATE
PROJ DIR	
QA MGR	
INDEPENDENT SAFETY MGR	
PROJECT MGR	
SYSTEMS MGR	
ENGINEERING MGR	
SUPERVISOR C.W. Wilson	12/18/92
DESIGN ENGINEER	12/18/92
CHECKED J. Heshmand	12/18/92
DRAWN L.C.SANVICTORES	2-05-92

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FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

ME-130-001
MELTER
ARGON FEEDING TUBE
DETAILS

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P06A
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CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
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M103 ACAD

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CADCODE	2B:IBM:ACD2:10.C2:SS

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SIGNATURE	DATE
PROJ DIR	
QA MGR	
INDEPENDENT SAFETY MGR	
PROJECT MGR	
SYSTEMS MGR	
ENGINEERING MGR	
SUPERVISOR	12/15/92
DESIGN ENGINEER	12/16/92
CHECKED	12/16/92
DRAWN L.C.SANVICTORES	2-13-92

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FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

ME-130-001
MELTER
ARGON FEEDING TUBE
SECTIONS & DETAILS

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	OWBS NO.
B-595	8457	P06A

SCALE	BLDG NO.	INDEX NO.
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CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
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INITIALS: PN
DATE: 12-16-92

QUALITY LEVEL 1
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0	12/18/92	APPROVED FOR CONSTRUCTION	JF AC CJW

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REV _____ DATE _____
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SIGNATURE	DATE
PROJ DIR	
QA MGR	
INDEPENDENT SAFETY MGR	
PROJECT MGR	
SYSTEMS MGR	
ENGINEERING MGR	
SUPERVISOR C.N. Woon	12/18/92
DESIGN ENGINEER	12/18/92
CHECKED	12/18/92
DRAWN L.C.SANVICTORES	4/02/92

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FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

ME-130-001
RISER DUMMY HEATER ASSEMBLY

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P06A
SCALE: 1/4	BLDG NO.: 1	INDEX NO.:

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
NONE	NOT REQD	H-2-120365	1	1	0

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QUALITY LEVEL 1
SAFETY CLASS 3

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0	12/16/92	APPROVED FOR CONSTRUCTION	QA GR CP

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SIGNATURE	DATE
PROJ DIR	
QA MGR	
INDEPENDENT SAFETY MGR	
PROJECT MGR	
SYSTEMS MGR	
ENGINEERING MGR	
SUPERVISOR C Wilson	12/18/92
DESIGN ENGINEER C Russell	12/18/92
CHECKED J. Husband	12/18/92
DRAWN L.C.SANVICTORES	8/29/91

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FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

MY-130-001
MELTER SUPPORT BEAM
PARTS LIST & NOTES

A

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P06A
SCALE: 3/4" = 1'-0"	BLDG NO. 1	INDEX NO.

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
NONE	NOT REQD	H-2-120403	1	4	0

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SAFETY CLASS 3

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SIGNATURE	DATE
PROJ DIR	
QA MGR	
INDEPENDENT SAFETY MGR	
PROJECT MGR	
SYSTEMS MGR	
ENGINEERING MGR	
SUPERVISOR	12/15/92
DESIGN ENGINEER	12/15/92
CHECKED	12/16/92
DRAWN J.KAPPELER	3-26-92

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FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

MY-130-001
MELTER SUPPORT BEAM ASSEMBLY

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P06A
SCALE: SHOWN	BLDG NO.: 1	INDEX NO.

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
NONE	NOT REQD	H-2-120403	2	4	0

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SAFETY CLASS 3

DEC 23 1992

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0	12/18/92	APPROVED FOR CONSTRUCTION	JL AR CJW

CADFILE	B120403C	CADCODE	2B:IBM:ACD2:10.C2:SS

ENGINEERING RELEASE
REV _____ DATE _____
ERO _____

SIGNATURE	DATE
PROJ DIR	
QA MGR	
INDEPENDENT SAFETY MGR	
PROJECT MGR	
SYSTEMS MGR	
ENGINEERING MGR	
SUPERVISOR C J Dixon	12/16/92
DESIGN ENGINEER G Russell	12/18/92
CHECKED L Hubbard	12/18/92
DRAWN J.KAPPELER	3-27-92

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DE – AC06-86RL10838

FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

MY-130-001
MELTER SUPPORT BEAM ASSEMBLY & SECTIONS

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P06A
SCALE: SHOWN	BLDG NO.: 1	INDEX NO.:

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
NONE	NOT REQD	H-2-120403	3	4	0

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DATE: 12-16-92

QUALITY LEVEL 1
SAFETY CLASS 3

DEC 23 1992

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0	12/18/92	APPROVED FOR CONSTRUCTION	QE GAC CP

CADFILE: B120403D | CADCODE: 2B:IBM:ACD2:10.C2:SS

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REV _____ DATE _____
ERO _____

SIGNATURE	DATE
PROJ DIR	
QA MGR	
INDEPENDENT SAFETY MGR	
PROJECT MGR	
SYSTEMS MGR	
ENGINEERING MGR	
SUPERVISOR C.M. Wan	12/15/92
DESIGN ENGINEER C. Powell	12/16/92
CHECKED D. Eberhard	12/16/92
DRAWN S.TORRES	05/06/92

U.S. DEPARTMENT OF ENERGY
Richland Field Office
DE – AC06-86RL10838

FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

MY-130-001
MELTER SUPPORT BEAM SECTIONS & DETAILS

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P06A
SCALE: SHOWN	BLDG NO.: 1	INDEX NO.

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
NONE	NOT REQD	H-2-120403	4	4	0

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0	12/18/92	APPROVED FOR CONSTRUCTION	AT

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REV _____ DATE _____

ERO _____

SIGNATURE	DATE
PROJ DIR	
QA MGR	
INDEPENDENT SAFETY MGR	
PROJECT MGR	
SYSTEMS MGR	
ENGINEERING MGR	
SUPERVISOR D.H. McWhorter Hleiney	12-17-92
DESIGN ENGINEER A. Talebi	12-17-92
CHECKED K. Kovell	12-17-92
DRAWN S.DREYER	9-22-92

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FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

ELECTRICAL GENERAL NOTES SYMBOLS AND DETAILS

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P06A
SCALE: NONE	BLDG NO.: 1	INDEX NO.:

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
NONE	NOT REQD	H-2-122420	1	2	0

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